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TEA RESEARCH INSTITUTE

OF CEYLON



THE TEA RESEARCH INSTITUTE,
St. Coombs, Talawakelle,

Ceylon.

NOTICES

General.—The laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director Tea Research Institute, Talawakelle. Telegraphic address: RESEARCH, TALAWAKELLE, Telephone: Talawakelle 44 (Private Exchange).

It is particularly requested that letters should not be addressed to officers by name. Specimens and other consignments sent by rail should be forwarded to Talawakelle Station, C/o Messrs. M. Y. Hemachandra & Co. Ltd., Forwarding Agents. Carriage should be pre-paid.

Low country estates should address their correspondence and enquiries to St. Coombs for the time being.

Visitors' Days.—The *second* and *last* Wednesdays in each month have been set aside for Visitors' Days at St. Coombs Estate and also at the T.R.I. Sub-Station Gonakelle Estate, Passara, when it is hoped anyone interested will visit the stations.

Guest House Rules.—(1) The St. Coombs Guest House is normally intended for persons visiting the Institute and St. Coombs Estate on business. Children can in no circumstances be accommodated.

(2) Permission to occupy a room for the night must be obtained from the Director in writing and, unless sufficient notice be given, accommodation cannot be guaranteed.

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(6) All breakages will be charged for at cost price.

Publications.—The *Tea Quarterly* and *Bulletin* published by the Tea Research Institute will be sent free of charge, to Superintendents of Ceylon tea estates, over 10 acres in extent, and to estate Agencies dealing with Ceylon tea, if they register their names with the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle.

Other persons can obtain the publications of the Institute on application to the Director, the subscription being Rupees fifteen per annum for persons resident in Ceylon or India, and £1-5-0 for those resident elsewhere. Single numbers of *The Tea Quarterly* can be obtained for Rs. 2-50 or 4s. In the case of Indian cheques four annas should be added to cover commission.

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tute and the experiences of the practical planters could be freely exchanged, and where the managements and Superintendents of estates could indicate their ideas on the subject to Government, as represented by the Tea Controller, and obtain clarification on the multifarious problems connected with the administration of the Scheme. The expressions of appreciation recorded are very gratifying and serve as a stimulus to the Institute to greater effort in the cause of the industry which it has been established to promote.

If the keenness displayed by participants of the symposium in its proceedings in respect of both the technical and administrative aspects of the Scheme is an augury of the interest that is likely to be taken in the Scheme itself, there is good hope for believing that it will now receive the support which is so essential for a Scheme of this nature. A good deal of credit for this changed outlook should go to the Tea Controller, Mr. B. Mahadeva, who, by his sympathetic and helpful attitude in viewing the representations made by the industry on the numerous issues involved, created a spirit of mutual confidence and co-operation which must necessarily result in the more efficient and smoother working of the new project.

To all those who have in any way contributed towards the success of the symposium, the Institute and the Board tender their cordial thanks.

SYMPOSIUM ON TEA REHABILITATION AND REPLANTING

COLOMBO, 28TH NOVEMBER, 1958

PROGRAMME

MORNING SESSION

9 a.m. - 12.30 p.m.

Tea Interval 11 a.m. - 11.10 a.m.

- 9.00 A.M. I. **Opening.**—Opening of the Symposium and welcoming of the Hon'ble Minister and invitees by the Chairman of the Tea Research Institute.

Address by the Hon'ble the Minister of Agriculture and Food.
Vote of thanks by Chairman of the Tea Research Institute.

- 9.30 A.M. II. **Technical Papers on Rehabilitation and Replanting.**—

1. General Survey of the Position — Dr. A. W. R. Joachim, Director, T.R.I.
2. The Position of Clonal Selection in Ceylon in Relation to Replanting — Dr. T. Visser, Plant Physiologist.
3. Experiences Overseas on Replanting with High-yielding Material — Mr. F. H. Kehl, Vegetative Propagation Officer.
4. General Principles of Soil Rehabilitation — Mr. J. A. H. Tolhurst, Agricultural Chemist.
5. Some Practical Aspects of Rehabilitation and Replanting— Mr. T. B. Pethiyagoda, Superintendent, St. Coombs.
6. The Economic Aspects and Problems of Replanting — Mr. G. K. Newton.
7. Quality in Relation to Clonal Varieties — Mr. T. Kane.
8. Selection and Quality — Mr. E. L. Keegel
(15 minutes discussion will follow each paper)

III. Addresses by Overseas Representatives:

Mr. M. J. Green, Indian Tea Association, Tocklai.

„ W. J. Grice, „ „ „ „

AFTERNOON SESSION

2 p.m. - 5.30 p.m.

Tea Interval 3.30 p.m. - 3.40 p.m.

- 2.00 P.M. I. Representatives of the following tea areas will briefly survey the position in regard to tea rehabilitation and replanting in their respective districts.

- | | |
|---------------------------|---------------------------|
| (a) Uva | (Mr. Gorton Coombe) |
| (b) Sabaragamuwa | (Mr. W. J. Craig) |
| (c) Kelani Valley | (Mr. R. J. S. Bean) |
| (d) Southern Province | (Mr. H. B. Goonewardene) |
| (e) Kandy District | (Mr. Gordon Pyper) |
| (f) Dimbula-Dickoya | (Mr. R. C. Scott, C.B.E.) |
| (g) Nuwara Eliya District | (Mr. R. Beadon) |

(Following each paper 5 minutes will be allowed for questions)

3.40 P.M. II. The Administrative aspects of the Rehabilitation and Replanting Scheme by the Tea Controller, Mr. B. Mahadeva.

III. Summary of technical discussions and recommendations by the Director.

5.30 P.M. IV. Close of Symposium by the Chairman.

OPENING ADDRESS BY MR. F. AMARASURIYA, CHAIRMAN, BOARD OF CONTROL, TEA RESEARCH INSTITUTE

It gives me great pleasure, as Chairman of the Board of Control of the Tea Research Institute of Ceylon, to extend to the Hon'ble Minister of Agriculture and Food, on behalf of the Tea Research Institute and the tea planting community of the Island, a warm welcome to the opening of the Symposium on Tea Rehabilitation and Replanting.

This is the second Symposium which the Institute has organised within recent years and it is only appropriate that the theme of the Symposium should, on this occasion, be the replanting of tea, the scheme for which, has under your direction, come into effect recently.

We can assure you that we shall, on our part, endeavour to do everything possible to ensure that the Scheme is a success, and it is with a view to giving all tea interests concerned an opportunity of acquainting themselves with the latest technical developments on the subject of replanting and to obtaining their views on various aspects of the Scheme that the Board of Control of the Tea Research Institute has decided to organise this Symposium.

You, Sir, have shown your keen interest in the Tea Research Institute by recently obtaining for it a large loan, free of interest, for the establishment of the Low-Country Sub-Station, and we are very appreciative of your good offices in this regard.

I have also to welcome Senator C. Wijesinghe, Minister of Nationalised Services and Road Transport who, as a planter, has always evinced a keen interest in the tea planting industry in a very intimate way and has encouraged us with his presence today. We assure him that we are very conscious of his interest in us, especially when, as Acting Minister of Finance, he sponsored the loan for the Low-Country Sub-Station.

We have today from overseas, Messrs. M. J. Green, Botanist, and W. J. Grice, Advisory Officer, from the Tocklai Tea Experimental Station, and Mr. Ananda Rau, Chief Scientific Officer of the Tea Research Station, South India. We are very happy to see them here and to have the benefit of their views in the course of our discussion. We hope their stay in Ceylon will be a pleasant one, and are doing our best to help them to see something of the tea industry of this Island during their short stay. We were hoping that we might have the privilege of the presence of Dr. F. R. Tubbs, one time Plant Physiologist of the Institute and Adviser in the United Kingdom to the Tea Research Institute Board, but unfortunately owing to unavoidable circumstances he is unable to be present.

I am also pleased to welcome the representatives of Government Departments, sister Research Institutes, and other interested organisations in the country who have responded to our invitation.

Finally, I have to welcome our Visiting Directors from London, representatives of the Planters' Association and of its Agency Section, of the Low-Country Products Association, and of the District Planters' Associations, and to thank them all for their attendance at this Symposium.

I will now, Sir, ask you kindly to declare open this Conference and to give us some words of encouragement and advice.

ADDRESS BY THE HON'BLE D. P. R. GUNAWARDENA, MINISTER OF AGRICULTURE AND FOOD

I am very glad that the Tea Research Board has decided to hold this Symposium to mark the inauguration of the Government's new Tea Replanting Subsidy Scheme. It will enable leading representatives of the Island's tea industry to exchange ideas and information on replanting, to discuss with the Scientists of the T.R.I. various technical matters relating to the replanting of tea, and to obtain from the Tea Controller any information or clarification they may require regarding the administrative and financial set-up of the new Scheme. I am also glad that the Tea Research Board has taken this opportunity of publishing a little booklet in which detailed information about replanting tea with vegetatively propagated material has, for the first time, been collected together and published in a compact and lucid form.

The record of Ceylon's tea industry over the last 20 years is one in which the industry can take a legitimate pride. Ceylon's total production of tea has increased by over 70 per cent. since 1939, from about 230 *million pounds* to last year's all-time record of just under 400 *million pounds*. This spectacular increase in production has been achieved with practically no change in the acreage under cultivation. It has been achieved by the adoption of steadily-improved cultivation methods and, in particular, by the greatly increased use of fertilizer and the development of new techniques of disease control. You will recall that, barely ten years ago, there was an alarming increase in the incidence of blister blight and there were many prophets of gloom who predicted that Ceylon's tea industry would soon be completely wiped out just as her coffee industry had been wiped out by disease eighty years earlier. Thanks, however, to the intensive research done by the T.R.I. and the remedial measures adopted by planters on the advice of the Institute, blister blight has now been brought almost completely under control and the Island's tea plantations are today probably in better shape than they have ever been before.

The spectacular increase in the Island's tea yields over the last 20 years have been due, as I have said before, to better cultivation methods, to the increased application of fertilizers and the adoption of improved methods of disease control. *Unfortunately, little or no attempt has hitherto been made by estates to increase yields by replanting of old tea areas with high-yielding clones. In the last five years, less than 100 acres of old tea have been replanted in all the Island's plantations put together, as compared with a 100,000 acres of old rubber replanted in the same period under the Government's Rubber Replanting Scheme. The reason for this is clear. In tea, unlike in rubber, no high-yielding clones for use in replanting had been developed until very recently. In rubber, we were able to reap the benefits of extensive breeding-research done in Malaya and Indonesia and practically all the replanting we are now doing in Ceylon is being done with Malayan and Indonesian clones. In tea, unfortunately, we had no similar foreign experience to fall back on. The Soviet Union was probably the only foreign country which had done extensive breeding-research in tea, but their high-yielding varieties of tea had been bred for soil and climatic conditions very different from our own. Before therefore we in Ceylon could embark on an extensive replanting programme, we had to wait until the T.R.I. had developed high-yielding clones suitable for large-scale planting in Ceylon. Although research on this subject had been going on for a number of years, it was only as recently as*

1955 — at the T.R.I. Conference held in February of that year — that the scientists of the T.R.I. felt confident enough to recommend replanting on estates with vegetatively propagated high-yielding clones.

Shortly after the present Government came into power, my Ministry prepared, in consultation with the various planting interests concerned, a comprehensive Tea Replanting Subsidy Scheme aimed at encouraging estates to replant old tea areas with the newly-developed high-yielding clones. The Scheme envisages the payment of generous subsidies of Rs. 2,500 for every acre replanted. The legislation for the Scheme was enacted in April this year, but owing to the unfortunate depression in the tea market it was only possible to bring the new Act into operation a few weeks ago. Applications under the Scheme have already been invited by the Tea Controller and it is hoped that replanting operations under the Scheme will commence early next year. *The Scheme aims at replanting a minimum of 30,000 acres in the next five or six years resulting in an increase of at least 40 million pounds in Ceylon's annual production of tea.*

There are some pessimists who have expressed doubts on whether this expansion in the Island's tea crop is desirable. The world's tea markets are already faced, they tell us, with a burdensome surplus of tea. New areas, they remind us, are coming into production in Africa, while Chinese tea production is likely to increase very soon by leaps and bounds. I do not share these fears. It is true that the world's production of tea is increasing and will continue to increase. But world consumption is rising just as steadily. India, for instance, already consumes internally more than half her total tea crop and a very small increase in the consumption of tea per head of population could change India's exportable surplus into a deficit. Rising living standards in China and the countries of the Middle East will undoubtedly absorb vastly increased quantities of tea. I feel therefore that we can confidently embark on this Replanting Programme. As far as Ceylon's high-quality teas are concerned, they have always enjoyed and will continue to enjoy a ready market. Our mid-grown and low-grown tea, on the other hand, can survive in the face of competition from African tea produced by workers on miserably low wages if, and only if, we replant our estates with high-yielding clones and thereby substantially reduce our costs of production. For all our estates, therefore, whether high-grown or low-grown, replanting is an urgent and vital need.

I know that you have a crowded Agenda for today's Symposium and I do not wish therefore to delay your proceedings. There are one or two matters, however, to which I would like to refer briefly before I close.

The first is the important part — the vitally important part — which *scientific research* has played and must continue to play in the development of the tea industry. The T.R.I. has a proud record in the past. We must see to it that we give the Institute every assistance and encouragement to carry on its good work in the future. To stint on scientific research would be short-sighted folly of the worst type. Nothing would more certainly seal the doom of the tea industry. Other progressive countries — the countries which are progressing furthest and fastest today — place tremendous stress on science and technology. A Tea Delegation sponsored by the Tea Research Board recently visited the Soviet Union to study the Soviet tea industry. The leader of that Delegation tells me that, at what corresponds to our T.R.I. in Georgia, there are 90 scientists engaged in research, including 4 Doctors of Science and 35 others with post-graduate scientific degrees — all for a tea industry which is barely one-third the size of ours. We will not, of course, be able to match large scientific institutions of this type, but we must do all we can, within our limited resources, to make the best available scientific talent available to the T.R.I. and other agricultural research institutes in this country. I am sorry to learn that the

two eminent scientists, Dr. Mellanby and Dr. Eden, who were offered the post of Director of the T.R.I. have found it necessary to decline the appointment on personal grounds. I hope you will soon be able to secure the services of a permanent Director and to fill the other vacancies on the Institute's scientific staff. I can assure you that my Ministry will always be ready to give the Institute every possible assistance in this connection.

The other matter I wish to refer to is the question of *factory construction*. Although there has been a 70 per cent. increase in Ceylon's total production of tea in the last 20 years, there has been no corresponding expansion of factory capacity. As a result, in many areas, estate factories which formerly had surplus capacity are no longer able to take in smallholders' leaf. To meet this difficulty, my Ministry has prepared a Scheme, which is now under consideration by the Government, for erecting or acquiring tea factories for small-holders on a co-operative basis. As the new Replanting Scheme progresses and gathers momentum, this question of factory-capacity and factory-construction will become even more acute and it is necessary to make plans immediately to meet these difficulties when they arise. When constructing new factories or renovating and extending existing ones, we should consider whether we cannot adopt cheaper and more efficient methods of tea-manufacture. Unfortunately, research on the *manufacturing* side of the tea industry has lagged far behind *agricultural* tea research in this country. I feel that this aspect should be given far greater attention by the Tea Research Institute in the future, as a saving of even a few cents a pound in the cost of manufacture of tea will save the country and the industry many millions of rupees annually.

I need hardly say that the entire success of the new Tea Replanting Scheme will depend on the whole-hearted support and co-operation of the planting community. Thanks to your co-operation and support, the Government's Rubber Replanting Programme has been working smoothly and successfully. I have no doubt that the same measure of co-operation and support will be extended by you to the Tea Controller for the working of the new Scheme. It is with this hope, and with my fervent good wishes for the complete success of the Scheme, that I have great pleasure in declaring this Symposium open.

VOTE OF THANKS BY THE CHAIRMAN,
BOARD OF CONTROL,
TEA RESEARCH INSTITUTE

Sir, I must thank you on behalf of the Board and the planting community for the good things you have said this morning. I must also thank you on behalf of the members of the Tea Research staff for all you have said about them.

I would like to stress on you, Sir, the difficulties that we are faced with. We have been for the last one and half years trying to find a Director—a suitable Director to take up this post, which is all-important at a time like this. Unfortunately, some of the best candidates we have had, have at some time or other, withdrawn their names for personal reasons. But I really think, from what I gathered when I was in London from Dr. Tubbs, is that our structure of taxation seems to drive them away. So, if you could kindly make some concession till at least the junior officers who are to-day working under the senior staff can get into their stride at least for a 5-year period and give us some relief so that we can get out some of the best senior scientists here, it would greatly help indeed this all-important scheme of tea replanting. You know gentlemen we got some tea here that is well over 120 years. Soils have been depleted. Well, if we want to increase the national wealth of the country, the only way to do so is to increase our production, and the only way we can increase our production, is by adopting the latest methods of cultivation and replanting our old tea. And to do this it is essential, I think, that we should have the best men to do the research and the scientific part of the work. So, while thanking you for your very kind presence here and for what you have said, I would beg of you to consider this matter and give us this relief so that we could get out some really capable scientists to fill these very senior posts. Thank you, Sir,

A GENERAL SURVEY OF THE POSITION IN REGARD TO TEA REHABILITATION AND REPLANTING

A. W. R. Joachim

One of the functions which I have been assigned at this symposium is to survey the present position regarding the replanting of tea with vegetatively-propagated clonal material under a scheme which is shortly to be brought into force by Government for the rehabilitation of the tea industry. To do so effectively, I should outline briefly the stages of this new development over the past 20 years.

Historical

Following on the pioneering work of Dr. F. R. Tubbs, former Plant Physiologist of the Tea Research Institute on the vegetative propagation of tea which he first described at the Tea Research Institute Conference of 1939, steady progress was made with the study of the subject despite set-backs caused by the lack of staff during the War years and the concentration of work on the control of blister blight subsequently. It was, therefore, only at the 11th biennial Conference in 1955 that Mr. G. B. Portsmouth, who succeeded Dr. Tubbs, advocated that vegetatively propagated clonal material should be used for the new planting of tea and the replanting of worn out and uneconomic areas of the crop. Studies on promising clones selected earlier had indicated that yields of the order of 2000 lb. per acre per annum could be expected from them provided suitable agronomic measures were adopted.

At this Conference representatives of the industry made a request that Government, as in the case of the rubber industry, should encourage the replanting of tea by earmarking a proportion of the export duty on tea for this purpose.

Shortly afterwards, at the request of the Government, the Planters' Association in consultation with the Low-country Products Association made certain proposals for the introduction of a Tea Replanting Subsidy Scheme on the lines of the existing Rubber Replanting Subsidy Scheme. Based on these suggestions, the Ministry of Agriculture prepared a comprehensive 5-year programme for the rehabilitation of the tea industry and obtained the approval of Government for the scheme. The necessary legislation has been enacted, and replanting under the scheme will commence early next year. It is with a view to considering the technical as well as administrative aspects of the scheme that this symposium has been organised and all tea interests concerned invited to make their contribution to the discussions.

It has been urged by some that the symposium is somewhat premature, but it will be agreed that by pooling our knowledge, experience and ideas on this subject, we will be better able to make a success of the scheme than if we were to launch out on it haphazardly and based on our individual limited experiences. There are

many questions and problems of a technical and administrative nature which remain to be clarified, and this symposium will give the planting community as well as proprietary and agency interests an opportunity to ask questions thereon and obtain replies thereto.

Vegetative Propagation

To deal now with the technical aspects of the scheme. In order to ensure success it is necessary that both aspects involved, namely, the rehabilitation of uneconomic tea land and its replanting with vegetatively propagated material will have to receive attention. As regards the techniques of the vegetative propagation of tea, much additional information has been obtained by the Institute during the past two years and this is incorporated in the leaflet by Dr. Visser and Mr. F. H. Kehl which has already been issued to participants of the symposium. If the instructions specified in this publication are carefully followed, successful results with the vegetative propagation of cuttings in the nursery and on their transfer to the field may reasonably be expected.

There are, of course, a number of other issues relating to this aspect of the scheme which have to be considered. In the first instance it may be asked whether we have an adequate number of clones of high-yielding, good-quality material at present and whether planting material of such clones will be available in sufficient quantities. Dr. Visser will deal with these questions in his paper, but it would appear that there are at least 35 clones of average or above average quality which are available for our purpose. This number would steadily increase as the scheme advances. In regard to the adequacy of clonal material, Appendix I* circulated among invitees will indicate that there is available on a number of estates a fair quantity of planting material, in excess of their needs, for sale to others participating in the Scheme. In addition, a substantial amount will be forthcoming from our own clonal areas at St. Coombs. Some notes on the performance of these clones are furnished in Appendix II*

Owing to the wide range of elevation and climatic conditions under which our tea is grown, planting material which is suitable for the up-country tea districts may not necessarily be suited for low-country areas or even for Uva. For this reason the Institute has already established two V.P. proving units in the Uva and Kalutara districts, and proposes to establish three other such units in the Ratnapura, Galle and Kandy districts respectively. These units will primarily be clonal proving stations, but would also be centres at which trials on the manuring, spacing, etc. of clonal varieties will be carried out, and from which planting material will be issued to estates in the areas concerned. Meanwhile, the Institute will readily collaborate with any private estate undertaking work of this nature, as at Enselwatte estate, Deniyaya, so that we may obtain as quickly as possible at least the essential information in regard to suitable clones for the area.

The question of the *quality* of clonal teas grown in different districts has not, so far, received adequate attention mainly because of the need for testing out such teas systematically for at least a year before a correct assessment of their quality characteristics could be made, and of the difficulties involved therein. But with the establishment of our district V.P. proving stations, which would be sited close to factories, and the installation in the latter of suitable small-scale manufacturing units designed for the testing of clonal material, this aspect of the work can be expected to make steady headway.

Another important matter which needs to be considered is that of advisory assistance to estates on nursery selection and management, and in regard to the

*See pages 237-241.

incidence of eelworms in fields to be replanted. This would involve the analytical examination of soil samples for pH (reaction), texture and eelworm content, and occasional visits to the site. It would necessitate, therefore, the appointment of additional staff to be trained to provide the necessary services.

Finally, there is the question of the collaboration of the tea tasters with the Institute in assessing the characteristics of the very large numbers of samples of clonal teas. While acknowledging our indebtedness to them for their close co-operation with the Institute in the past, we hesitate to take undue advantage of their services in the future. The obvious alternative would be the appointment, as at the Research Institute at Tocklai, North India, of an official tea taster to the Institute. It is to be hoped that a small fraction of the funds from the cess to be imposed for the replanting scheme would be diverted towards the efficient organisation of these V.P. stations, the installation of small-scale manufacturing units in the neighbouring factories, and the appointment of the advisory staff for the purposes in view. This proposal will no doubt commend itself to the Tea Controller.

Before passing on to the question of replanting proper, reference should be made to a subject which has not hitherto received much attention, namely, the effect of very heavy dressings of fertilizer which these potentially high-yielding clones would need, if yields are to be maintained at a high level, on the quality of the leaf. This problem will receive the attention of the Institute at an early date. At our symposium today we are privileged to have the benefit of the views of our well-known authority on these matters, Mr. T. Kane.

Rehabilitation and Replanting

And now to the consideration of questions on replanting proper. The principles of the rehabilitation of old and uneconomic tea lands will be dealt with by Mr. Tolhurst, and our experiences with the rehabilitation and replanting of such land will be outlined by Mr. Pethiyagoda, Superintendent of St. Coombs. The latter are somewhat contrasting: in one area of tea in a fairly protected location the results have been most encouraging; in the other, which is badly exposed to wind, the results were disappointing until a couple of years ago. This area is now coming on quite well.

A number of estates have kindly sent replies to our questionnaire on their experiences with V.P. These replies reveal that a good proportion of the 450 acres which are reported to be planted with clonal tea is on land which was previously under rubber, jungle, or mana, and that the results are very satisfactory so far.

Only about a quarter of the total acreage (approximately 100 acres) of our vegetatively propagated tea has been planted in sizable blocks of land previously under the crop, and the great majority of these areas are young. Most of the V.P. plants produced, which must have been adequate for hundreds of acres of tea have, hitherto, been used for filling vacancies. Consequently, yield data for clonal performance in old tea lands are meagre, but what little we have is very encouraging.

While there is good evidence to indicate that vegetatively propagated clonal material yields appreciably more than seedling tea under similar conditions of climate, soil, aspect and elevation on old rubber and new land, it must be conceded that there is but little evidence of how the two types of material would compare when planted on old tea land subjected to rehabilitation. On fundamental grounds, however, there should be little doubt that the superiority of vegetatively propagated material would be established even under these conditions, provided adequate attention is given to manuring and soil fertility maintenance.

The rehabilitation and replanting of tea land infested with meadow eelworm will need special consideration, and only further experiment will indicate what measures should best be adopted to keep the pest in check in such areas. Some new ideas on this subject will, however, be presented by Dr. Visser.

There are matters relating to the replanting of old tea land with clonal tea on which there is a diversity of opinion and practice. Some of these, like the need for and the period of rehabilitation with Guatemala grass for soil regeneration and disease control, will be discussed by Messrs. Tolhurst, Pethiyagoda and Visser. Others, such as the optimum planting distances, methods of planting, etc. are referred to in Appendix III* which is a summary of the replies received to our questionnaire to Superintendents of estates on replanting methods. To all those who have kindly replied to our two questionnaires on vegetative propagation and replanting I tender the thanks of the Institute for having collaborated with us in giving to the tea planting industry as a whole, the benefit of their experiences.

The Economic and Administrative Aspects of Replanting

And now to the other equally important aspect of our deliberations to-day, namely the economic and administrative problems connected with the replanting scheme. The former will be dealt with by Mr. G. K. Newton who, with his wide experience of tea planting over many years, is best fitted to analyse the economics of the Scheme. The administrative details will be discussed by the Tea Controller, Mr. B. Mahadeva. There is no doubt that many questions will be posed on such matters as the interchangeability of tea with rubber and other crops under the scheme, the use to which land unsuitable for replanting with tea should be put, etc. These will receive consideration at the later stages of our discussions, but I would urge that lands unsuitable for replanting with tea should be put under fuel or Guatemala grass and not be allowed to lie fallow and denuded of the little soil they possess:

Pertinent to the discussion on the details of the replanting scheme will be the question of the use of clonal seed, if such were available in the Island, in regard to which Mr. F. H. Kehl, from his recent experiences overseas, will have something useful to say. It would, in this connexion, be of interest to the tea industry to learn that proposals are in hand for appointing a Plant Breeder to the Institute to initiate the work on tea seed breeding and related problems.

Conclusion

Gentlemen, before concluding I must thank the representatives of District Associations for having kindly consented to give brief reports of the position in regard to vegetative propagation and replanting in their respective areas. I have no doubt that the information they furnish will be of great value to the tea planting industry which is about to embark on one of the most important measures it has been called upon to undertake for many years. I will end on a note of optimism. In anticipation of this Symposium I had written to Dr. Tubbs advising him that a scheme for the replanting of old and uneconomic tea with V.P. material was to be started shortly. I quote his reply: "I might say what pleasure it gave me to read your very kind sentence in the 4th paragraph of your letter dated 11th October. Good luck to you all in the work, because I am certain that given good fortune the replanting with the clones you now have available could work an improvement far beyond even our present dreams." Gentlemen, I need say no more for the present.

*See pages 247-250.

THE POSITION OF CLONAL SELECTION IN CEYLON IN RELATION TO REPLANTING

T. Visser

1. Introduction

There is scarcely any need for argumentation in favour of replanting with high yielding clones producing a good quality of tea. The main reason is that, so far as is known, little or no seed is grown in Ceylon capable of giving yields comparable to that of selected and vegetatively-propagated clones.

This point may be illustrated by an example provided by two low-country estates which planted (good) seed at stake under similar conditions of soil and site and at the same time as plants from selected clones. In the one case the clonal area ($\frac{1}{2}$ acre) is made up of 10 clones, in the other instance an area with a mixture of about 70 clones ($2\frac{1}{2}$ acres) was planted. In both cases the clonal areas yielded crops over 2,500 lb. made tea per acre a few years after they came into bearing, against yields of about 1,500 lb. per acre from comparative seed areas of the same age. This is more or less what one would have expected as clones are selected after all on a minimum yield capacity twice as high as that of good estate tea.

Since replanting is considered with clones selected both at St. Coombs and other estates it is proposed to give an idea of the present day position of clonal selection in Ceylon.

2. Selection by the Institute

Selection started at St. Coombs in 1938. In that year and the two following years 2,760 bushes were selected on the estate and their yield recorded. By 1943, 80 clones were considered good enough for establishment in clonal plots. Of this number, only 7 (or 0.25% of the original number) were eventually approved on account of their yield and/or quality. In 1946 nursery selection on more than 1,500 seedlings was started resulting in a choice of 10 promising clones (about 0.6% of the total). The small percentages selected are an indication that a very thorough selection is required to obtain a relatively small number of outstanding clones.

Between 1938 and 1958 a total number of 290 clones were established at St. Coombs; of which 140 were selected at St. Coombs itself, the rest were selections made on other estates. More than half of these clones have been rejected in the course of time, leaving 55 clones of which 14 have been finally approved up to date, while 60 clones are not yet in bearing (planted in 1956).

It may be mentioned that another 150 clones have been established by the Institute in multiplication plots in 3 other centres: viz. 64 clones at Passara (21 from St. Coombs), over 80 clones at Neuchatel (11 from St. Coombs) and 43 clones (12 from St. Coombs) at Enselwatte. The work will be expanded by the establishment of a fourth station in the mid-country next year, while clonal work will also be undertaken at the Low-Country Station near Ratnapura.

3. Selection on other estates

The progress made in clonal selection in the rest of the Island is unfortunately not so clear, but an estimate can be made on the basis of data obtained from the circular sent to over 1,000 estates in Ceylon, but answered only by about 25 per cent of them. The following table comprises the number of estates which have carried out their own selection, the number of clones selected in total and on the basis of acreage of low-, mid- and up-country.

Table 1. *The approximate position of clonal selection on estates other than St. Coombs as derived from data supplied by 25 per cent of the estates contacted (total 1,052).*

	Low-country <2,000 ft.	Mid-country 2,000-4,000 ft.	Up-country >4,000 ft.	Total
No. of estates which selected their own clones	9	22	22	53
No. of clones selected	41	86	110	237
No. Clones selected 10,000 acres* /	2.14	3.60	7.64	4.12

**Based on total acreage of low-mid-and up-country respectively.*

The above table shows that the up-country estates have been more actively concerned with clonal selection than the mid- and low-country estates.

According to the table only 5 per cent of the estates appear to have carried out selection, but the percentage is probably in the order of 7-8 per cent as our survey does not comprise all estates. Similarly, the total number of clones under test is likely to be in the order of 300 to 400, although according to the information received the number of clones is about 240 only.

With regard to T.R.I. clones, favourable reports on the growth and establishment of some of the best known ones (the 20-series) were received from 25 estates (from 5 low-, 8 mid-, and 12 up-country estates). Clone 2024 appears to be most widely distributed followed by 2025, 2023, 2026 in that order. Although all these clones were selected at St. Coombs, their growth has been judged promising at different elevations by the majority of the planters which gave us their views.

4. Bush Characteristics

After having given a survey of selection at St. Coombs and other estates, we have tried to assess the position with regard to the different characteristics desired in clones.

I. **Rooting ability.**—It can be assumed that the majority of the clones selected root well or at least moderately well, because otherwise they would have been discarded on account of the difficulty of propagating them.

In this connection it may be remarked that, apart from inherent properties, the rooting of clonal cuttings is very much dependent on nursery conditions, as described in our V.P. pamphlet.

Climatic conditions affect rooting, but not as some planters believe, in the sense that rooting becomes more difficult with decreasing elevation. On the contrary, provided the nursery conditions are optimal, rooting takes place at an even faster rate at lower than at higher elevations. However, nursery conditions in the low-country are more exacting than up-country.

According to our experience, the best rooting is obtained during propagation between the end of the wet season and the middle of the dry season, before this period it is often too wet, and after, the condition of the cuttings is not optimal.

II. Yield.—A number of estates provided us with the yield data of their clones making it possible to obtain an idea about the potential availability of high yielding clones at present; the relevant information is presented in table 2.

Table 2. *Estimated yields on the basis of multiplication plots expressed in lb. made tea per acre.*

	1,000 to 1,500 lb.	1,500 to 2,000 lb.	2,000 to 2,500 lb.	2,500 to 3,000 lb.	More than 3,000 lb.	Total
No. Estate clones	4	5	17	4	16	46
No. T.R.I. clones *	4	23	18	5	5	55
Total	8	28	35	9	21	101

*Comprises also a number of clones sent for testing from other estates.

It would appear from the above table that at present 65 clones are available which are likely to yield more than 2,000 lb. per acre. However, the number of high yielders is probably much greater, of the order of 150 to 200, as all estates have not given yield data. Moreover, some of the lower yielders being still immature may be found to yield over 2,000 lb. in a few years' time, while some clones which are not yet in bearing may have to be added in the near future.

On the other hand, it can be expected that of the estimated number of 150 to 200 high-yielders, 50 to 75 per cent. may have to be discarded in due course on account of poor manufacturing qualities, susceptibility to diseases and pests and various other reasons.

III. Quality.—As far as the clones at St. Coombs are concerned, quality tests have been carried out on about half the number of clones under consideration for approval. A dozen or so have been found so far to produce average or above average tea. However, only a few clones combine both a high yield with good quality, in fact some of our best clones with respect to quality are not very high yielders. With regard to clones selected on other estates we feel that insufficient information is available on the manufacturing qualities of many of them.

5. Position with regard to Diseases and Pests

I. Blister Blight.—One of the diseases of great economic significance is blister blight. Selection for resistance to this disease has perhaps, apart from yield characteristics, had the most attention of all diseases and pests occurring in tea. The Institute has established since 1948 a number of 54 clones (37 from outside estates) which are all resistant to it. Of these, 30 clones are further observed on account of their high yield (15 yield more than 2,000 lb !). Also many of our already approved clones are resistant or fairly resistant. Therefore, the availability of blister-resistant clones for replanting purposes at present or in the near future can be considered favourable.

However, one has to reckon with the fact that the blister blight fungus may develop in time more virulent strains which will attack clones which are resistant now. Nevertheless, were this to occur there is no reason to worry unduly, as the spraying of high yielding fields is relatively much less expensive per lb. of made tea than fields giving comparatively low yields.

Moreover, the Institute is at present developing a new system of spraying based on sunshine records which so far shows good promise of being applicable in practice. It will mean that estates, especially those which have intermittent weather conditions, will be able to reduce their number of spraying rounds by at least 25 per cent. without an increase in infestation.

II. Yellow mite, Scarlet mite, Purple mite, Red spider.—Indications are that these pests are on the increase and the damage done, particularly by the first two (yellow mite attacks the flush, scarlet mite the mature leaves), has been serious (defoliation) at certain locations and in certain seasons. It is not impossible that improved bush management has contributed to the increase of these pests.

We have no data as to whether estates have paid attention to this particular feature of selection. Observations on the promising clones established at St. Coombs indicate that most of our clones are susceptible to a greater or lesser extent; 3 of our best quality clones have been found to be very susceptible to yellow mite. Whether or not a policy of rejection of susceptible clones will have to be adopted, will depend on the economic possibilities of chemical control. Naturally, the selection of mite-resistant clones is greatly to be recommended, but it is doubtful whether within a reasonable time a number of clones which are both resistant and produce an abundant crop of an above average quality tea can be found.

III. Shot-hole Borer.—We do not need to emphasise the fact that this pest does serious harm at elevations below 4000 ft. So far an approximate number of 40 clones selected at different estates has been tested on resistance by the Entomologists.

About a dozen clones were found to be fairly resistant to shot-hole borer attack. However, it is not known as yet how many of these will continue to show resistance nor whether all are good clones from other points of view, like yield and quality. Some of the T.R.I. clones and a few estate clones show promise in that respect.

IV. Eelworm.—The information we have to-day on the prevalence of meadow and root-knot eelworm indicates that these eelworms can be found in varying numbers in many up-country areas and probably also at lower elevations as well.

Since a young tea plant succumbs much easier to infestation of both root-knot and meadow eelworm, than a mature bush, it is essential that the eelworm population in the soil be reduced to a minimum before replanting commences,

Fumigation as a means of control on a large scale is, though more or less effective, to be ruled out because of its costs. Fortunately, the reconditioning of tea lands with Guatemala grass is also to be recommended from the eelworm point of view. Originally the planting of this grass was advised in order to eliminate *Poria*, while providing at the same time large quantities of organic material assisting the reconditioning of the soil. In addition we have been able to confirm that Guatemala grass depresses the meadow eelworm population markedly. Its use for reconditioning is therefore advisable in eelworm suspected areas.

The second step to be considered following reconditioning is to prevent re-infestation and the build up of the remaining eelworm population. The former condition can be fulfilled by regular fumigation of the nursery and the soil used for basket plants. The cultivation of *marigolds* (preferably varieties of *Tagetes erecta*) as a "pre-crop" or as a cover crop together with the young tea plants may probably fulfil the latter condition, as these flowers have been found to reduce the eelworm population in the soil most effectively. Its cultivation, therefore, may be experimentally tried out.

Also *Crotalaria usaramoensis* and *C. anagyroides* showed a high resistancy to meadow and root-knot eelworms and are recommendable for use in suspected areas; the planting of *Tephrosia vogelii* in such areas should be avoided because of its susceptibility to both eelworms.

From the point of view of clonal resistance nothing definite is known as yet, but we hope to have some information on this subject on the near future. Some 70 clones are under trial in pot experiments at St. Coombs, while the same clones besides 45 others have been established in heavily infested tea soil. It is clear from preliminary observations that clones greatly vary in their susceptibility to meadow eelworm attack.

6. Conclusions

It can be concluded that the tea industry in Ceylon has made good progress in clonal selection over the past 20 years. However, there is still scope for expansion of selection work as less than 10 per cent. of all estates have been carrying out their own selections. Extension of this work is important, as indications are that in practice not much more than a dozen or so outstanding clones can be found per 500 acres. It must also be taken into account that different localities and elevations may require different clones.

Up-country estates have been more actively engaged in selecting than low-country and mid-country estates. This tendency is probably partly due to the lesser contact between the Institute's staff and the planters with increasing distances of estates from St. Coombs. This appears to be a good argument for the expansion of the Institute's work in this field in the low and mid-country.

Data on the quality of the selected clones seem to be scarce, so that a more systematic testing of the clones under trial is desirable. With regard to yield of the selected clones, the position would appear to be satisfactory as with selection the emphasis has been rather on this characteristic.

Selection on resistance to blister blight has been commonly carried out, so that the situation in this respect also appears to be encouraging. Selection on mite resistance seems to have been neglected, accordingly this characteristic deserves more attention while selecting. With regard to shot-hole borer some measure of resistance has been found to occur in a number of clones. Both mites and shot-hole borer possibly may be chemically controlled in the future, but resistant clones naturally are to be preferred.

Eelworm control by chemical means is a remote proposition for the time being. Alternatively, the growing of Guatemala grass and marigolds, *e.g.* in succession, promises to reduce soil infestation to insignificant levels. It is not impossible that a few of the clones under trial will be found to withstand eelworm attack to a fair extent.

Finally, it must be pointed out that the chances of finding clones which combine *all* desirable characteristics, including resistance to various diseases and pests, are probably only a fraction of what can be obtained when selection for one or two factors is carried out.

Taking into account that the information we have on selected clones is not by any means complete, it is estimated that some 35 to 70 good clones of an average or above average quality are available today. A proportion of these are likely to be found fairly resistant to one or more diseases and pests.

With regard to the availability of cuttings from these clones, of some—including a few T.R.I. clones—the supply will be sufficient, of others only limited numbers will be available. Although only a relatively few estates will have cuttings of a number of clones for sale they are likely to be able to meet the demand. According to the data collected at least 400 acres have been planted with clonal material up to date: 194 in the low-country (106 acres on 2 estates), 106 in the mid-country and 98 acres up-country. On the assumption that 1 acre of clonal bushes provides a minimum of 1 million cuttings and assuming that by 1960 about 5,000 acres will have to be replanted (at 10,000 cuttings per acre) only 50 out of the 400 acres are needed for the production of the required cuttings.

There is no doubt that a start can be made with replanting using good clonal material, though initially it may have to be done on some estates with a mixture of clones on which not *all* the relevant information is available as yet. However, as we estimate that less than half the number of estates have made a start with, or have sufficient experience in propagation, it is clear that nursery work will have to be greatly expanded if replanting is to become a general and successful practice in the near future.

EXPERIENCES OVERSEAS ON REPLANTING WITH HIGH YIELDING MATERIAL

F. H. Kehl

I have recently had the privilege of visiting for a short period 3 different regions where tea is cultivated on a large scale, namely, Georgia in the U.S.S.R., Assam in North India and Anamallais and Nilgiris in South India, for the purpose of studying the present position in regard to V.P. and plant breeding. I propose briefly to survey the observations made in regard to these subjects at this symposium.

Georgia, U.S.S.R.

The main tea plantations in the Soviet Union are located in Georgia where the climate is sub-tropical, but extremes of temperature prevail. The rainfall is about 90 inches and well distributed. The plantations vary in elevation from 100 to 1,500 feet.

Propagation of high-yielding quality teas in Soviet Russia is entirely from selected seed. Organised work on tea breeding was initiated about 1926. As a result of generous financial aid the Russians are forging ahead of other tea-growing countries in breeding work. Their preliminary trials indicated that continuous in-breeding has a deleterious effect on germination and growth, while out-breeding or hybridisation often results in offspring of considerable vigour. Moreover, they maintain that the high yielding and vigorous qualities shown by cultivated tea are due to their hybrid nature. Such plants are very heterozygous and contain many favourable genetic factors.

In their breeding work at the Chakwa Experimental Station in Georgia, all desirable characters of yield and vigour are being investigated. Special importance is attached to winter hardiness. The achievement of such a breeding objective permits tea to be grown in regions where the crop could not previously be grown. Breeders in Russia are very fortunate in that there are hardly any diseases and pests to contend with. Poria, blister blight, parasitic eelworms and shot-hole borer are unknown and most of the injurious mites found in Ceylon are of minor importance.

Breeding is a large and complex subject and I will confine myself to a few general principles. The first step in any scheme of breeding is selection which involves choosing the best bushes of those already existing, and hybridisation among these with the object of creating new genetic combinations. The factors for which selection work at Chakwa is made and the procedure adopted is as follows:—

1. **Yield.**—Promising bushes in State and Collective Farms are chosen for observation and individual records maintained.

2. **Quality.**—Leaf from each individual bush is chemically analysed for its polyphenol content but the final selection is made on the basis of tasters' opinion. Pubescence of the bud is thought to be an index to quality, but the All-Union Scientific Tea Research Institute in Maharadze, Georgia, has so far not obtained a correlation between hairiness and quality.

Frost resistance.—Bushes are selected on the following characteristics:—

- (a) Those that have a tendency to produce red or woody shoots.
- (b) Flat leaf types and not V shaped jats.
- (c) Dark leaf jats.
- (d) In regard to displacement or position of leaves on branches, oblique types rather than horizontal.

The selected bushes are allowed to grow as seedbearers. When seeds are formed they are collected and are grouped or classified according to the morphological features of the flowers and leaves of the parent bearers. Each group or form is grown in a separate row, and at flowering the bearers are hand-pollinated with pollen of the same group.

Every generation is examined closely, only those strains that display most of the desired characteristics being kept for further testing. For instance, in the progeny of the first generation as much as 80 per cent. of the hybrids are discarded. From the second generation onwards about 20 per cent. of the progeny is rejected. Four such generations have passed a very close scrutiny by a number of examining commissions and 7 lines have been eventually selected. These are said to produce plants that would yield about 30 to 40 per cent. more than commercial seed. The progeny of 3 Chinese hybrid types have shown greater winter hardiness than unselected seed, and are mainly used for planting in Northern regions where the temperature during winter is about 14°F. No large areas have, however, been planted with these approved types so that it is not possible to make any comments on their behaviour.

It has taken over 30 years to find 7 suitable varieties which is undoubtedly a long period but it must be realised that the usual time required for one generation, including yield and quality testing is about 7-9 years. Furthermore it is not often appreciated that certain bearers are unlikely to produce sufficient seed for the next generation even after 5 to 6 years.

Vegetative propagation was started in 1928 but much progress has not been made. At the All-Union Scientific Tea Research Institute we were informed that success in the nursery was about 70 per cent. and in the field almost 100 per cent., but no large scale planting has been undertaken as propagation by seed was considered more economical than V.P.

The clones tested by the Research Institute are more vigorous than seedlings, though in the first year of plucking the clones gave lower yields than the seedlings. This is probably due to the system of planting 4 to 5 seed per hole, but from the second year onwards clones have proved to be superior.

Assam

The tea gardens of Assam have in the past shown a preference to seed as high quality seed is readily obtainable. The commercial seed baries have for many years been ruthless in the removal of "rogues" and selected seedlings are used as replacements, with the result that they have developed strains of remarkable uniformity producing high yields and good quality teas.

This situation has brought about the routine replanting which is a feature throughout the Brahamaputra Valley. For the last ten years even tea yielding as much as 1,200 lb. has sometimes been uprooted and replaced with available improved

varieties. For instance, an estate of 400 acres extent obtains an average yield of over 1,850 lb. The best fields totalling 90 acres gave over 2,000 lb. per acre and the crop harvested from the lowest yielding field was 1,600 lb. This estate is uprooting tea and has in the past 3 years replanted 30 acres.

V.P. work was started about 20 years ago but it has only recently gathered a tremendous impetus, which is evident from the demand for material of the eight approved Tocklai clones some of which are yielding twice as much as that of seedlings.

The total area under V.P. is probably about 400 acres most of which is an old tea land. One Company which has a special officer in charge of their propagation work has made considerable progress. This Company has over 100 acres re-planted with 5 clones which are, however, not yet in plucking. One of their best clones has given over 3,200 lb. in a test plot. Incidentally there are other Companies which employ specialists for making selections, carrying out the propagation and maintenance of nurseries. Those estates have realised that a Manager or Superintendent has neither the time, nor the facilities for carrying out thorough trials of all selected clones under a variety of conditions and over a period of years.

The selective breeding of tea was started at The Tocklai Experimental Station about 1940. Although this work has not yet resulted in the production of high yielding types of high quality, it is anticipated that outstanding seed will be made available to estates in about 8 to 10 years.

Breeding work is carried out by the following methods:—

1. *Mass Selection*.—Seed of any good commercial jat are sown in a nursery and about 1 in 1,000 to 2,000 plants are selected for vigour, pubescence, and other desirable characteristics, as the future bearers. This method is not the ideal and is regarded as a temporary expedient; the progeny of such bearers will often be better than the best commercial seed that is available at the moment.

2. *Polyclonal Selection*.—Polyclonal seed gardens are established with about 8 to 10 desirable clones propagated vegetatively. Under the right conditions this method can produce satisfactory results with fair rapidity. If the first generation seeds give the desired plants, then a full scale seed garden is laid out. This method is tried by more than one seed garden.

3. *Pedigree or Bi-clonal Selection*.—Selected pairs, propagated vegetatively are mated artificially. Many of the disadvantages of mass selection are minimised in bi-clonal or pedigree selection. Tocklai has made numerous matings in the past twenty years and there is the possibility of obtaining definite results by about 1965.

No rehabilitation is often undertaken prior to replanting, though Tocklai has recommended that a green cover crop like *Crotalaria anagyroides* be grown for a period of one year or preferably two years. Where, however, the yield has been lower than 750 lb. per acre, the period of reconditioning advised is 3 years. The green crop is ploughed in about a month or two before the planting of tea.

South India

The total area replanted with V.P. in South India would probably be about 300 acres, mainly in the wet zone. Hardly any estate, subject to droughts use V.P. plants, but one estate that was visited has been very successful with clones. This estate which is subject to dry spells extending for 4-6 months has one outstanding clone that has proved to be far superior to seedlings which were a complete

failure; the casualties of the clones were almost nil. Approximately 100 acres on this estate are in V.P., 70 acres in new clearings, and the balance in numerous small blocks in the old tea. The results obtained only clearly indicate that clones can be grown in drought areas provided the right types are selected.

An estate at over 6,500 ft. elevation is making rapid progress in V.P. work. About 10 local clones are being propagated on a large scale. The growth made by the better clones in 5 to 6 years was reported to be equivalent to that of 10 to 12 year old seedlings.

Estates in the high range of South India use clones exclusively for infillings. Like in Assam specialists are sometimes employed for this work.

No large scale *replanting* is undertaken in South India but small uneconomical areas are uprooted and replanted with V.P. plants. The method of rehabilitation, where this is done, is similar to that of Assam.

General

As regards V.P. work, I think we are probably more advanced than Assam, South India or Georgia. We are in a position today to show our friends from Tocklai and U.P.A.S.I. excellent clonal fields in different parts of the island. The only difference between our replanting scheme and that of Assam is that we have not yet reached the stage where tea yielding as much as 1,200 lb. is uprooted and replaced.

India as well as other countries are steadily progressing with their tea production, and it must be emphasised that if we are to compete with other countries it is very essential that we should meet this competition with the production of high yielding tea of the highest quality. /

Before ending I would like to quote the words of a notice that was prominently displayed in one of the Pavilions of the Moscow Exhibition:

"Consider well the figures and results shown, and study the means by which they have been obtained. But do not regard these merely as a prescription, as a universal remedy, or immutable doctrine. Only on the basis of your work and efforts and continued research is it possible to find the correct methods for every individual case."

GENERAL PRINCIPLES OF SOIL REHABILITATION

J. A. H. Tolhurst

I shall be extremely brief in my comments, partly because I have already dealt at length with this subject, and you have a summary of my conclusions before you,* and partly because you will need all the time available to discuss other and more controversial aspects of replanting.

My original ideas concerning the value of various grasses remain unchanged. I can not think of a cheaper or more efficient way of protecting, consolidating and aerating soil which has undergone a violent disturbance, nor can I imagine a cheaper method of obtaining a rich organic manure. In addition, this manure, which is what the grass leaves, stumps, and roots eventually become, is distributed through the soil with a thoroughness that no human activity could achieve. I have no particular preference for any one species of grass although I usually speak of Guatemala grass. It is up to the man on the spot to select a species most suited to local conditions, and also to the purpose for which the grass is required. I believe that manna grass provides a more durable thatch than does Guatemala grass, but that the latter species has a more vigorous root growth.

When I wrote my article two years ago, it was based on the assumption that rehabilitation under a suitable crop would be compulsory, for a period of about two years. With the recent change in the new recommendations this is no longer so. From the soil scientist's point of view there can only be a small proportion of the land at present under tea which could be replanted without rehabilitation, and in general I should like to see rehabilitation crops grown for as long as possible. I am well aware that there is an economic side to this matter, but I have a very great respect for soil, which needs centuries for its formation, and I sincerely hope that economic considerations will never tempt anyone into treating the soil like so much inanimate brickdust.

The overriding consideration regarding rehabilitation is still, as it always has been, the pathological one. Both the length of the period and the nature of the crop are dependent on the presence of pests or disease organisms, and it is not possible for me to be any more precise on either point. If it is possible, on pathological grounds, for an area to undergo only a very short rehabilitation, then we shall have to pay more attention than ever to the actual planting hole, and the mixture used to fill it. There is no doubt as to the value of compost made from well rotted animal and vegetable residues, provided that sufficient soil is present to avoid stickiness, that it can be consolidated in the planting hole, and that the pH value is below about 5.0. There is also no doubt about the expense of producing enough compost to fill up to 5,000 medium sized planting holes per acre. My original idea was that there would be sufficient dried surface residue from the grass rehabilitation crop, in conjunction with a top soil full of grass roots, to be used as a perfectly suitable filling mixture, produced actually on the spot. Compost must be made properly if it is to be used for this purpose. Raw material will decompose after the tea is

* See appendix IV, pages 251-252.

planted, leaving a young, and vulnerable, plant with a small root system wandering through air pockets and at the mercy of a sudden drought. Similarly, compost must not be dry when it is in the planting hole. If several weeks are allowed to pass before the tea is planted, the dangers of lack of consolidation and of dryness will become remote. For this purpose I would advise against using town-refuse, wood-ash or saw-pit refuse, or any similar rubbish. Areas would have to be set aside for growing crops especially for compost, and, presumably, for animal feeding if required.

I doubt if compost will ever be an attractive proposition, except on small scale replantings, particularly when we remember that thatching material will have also to be found for use after the tea is planted, and probably for a considerable period. Again, land would need to be set aside for growing this crop, and however these areas are selected there is bound to be considerable expense involved. The more rehabilitation that is done on a replanted area the less need there will be for heavy thatch, brought from outside, during the first few critical months as there should be ample litter from the rehabilitation crop.

So far I have scarcely mentioned manuring during rehabilitation. I think you know my views on that subject by now, and in any event the printed summary which I referred to earlier leaves no doubt. In relation to the total cost and trouble involved, inorganic manure is not a large item, and if used as I hope it will be, there will be a transformation to an organic manure at a relatively ridiculously low cost. Finally, and to look ahead somewhat, after all the effort which will be put into establishing these high yielding clones, may I emphasise as strongly as I can that they will require manuring in accordance with their yield and vigour. We do not know how much manure will be required to enable a young clonal plant to reach maximum frame development and crop production capacity in the shortest possible time. Probably there will be a different answer for each clone and for each climatic zone, and there is plenty of scope for individual experiment. If you remember a general horticultural principle for manuring young plants, namely, "little and often," and as long as a balanced mixture is used, there need be no fear of experimenting with high annual dosages. In the coming months I hope to rewrite our Manuring Pamphlet and to include such information as I can collect on the response of clones, in the field, to high manuring rates, and the value to you of my remarks will depend very largely on how far you are able to supply me with the practical information.

SOME PRACTICAL ASPECTS OF REHABILITATION AND REPLANTING

T. B. Pethiyagoda

In view of the large expenditure we have incurred on St. Coombs in our efforts at rehabilitation and subsequent replanting, it is perhaps opportune now to review the success and failure we have had and the problems we still come across in establishing a fair cover of clonal tea on land which has grown tea for a number of years. This review should enable us to select uneconomic tea land that could profitably be replanted at reasonable cost and abandon other areas where clonal planting would not prove as economic or successful.

The first replanting was done in No. 10 field which had been under tea for about 20 years. The tea was uprooted with a monkey grubber and trenches were cut on the contour, the soil being heaped above the trenches. Guatemala grass was then closely planted between the trenches which were periodically filled in with the loppings. The grass was left for a period of approximately 2 years, during which period it was regularly manured. At the end of this period of rehabilitation, the grass was cut to ground level and used to fill the trenches. Different clonal blocks were then established in the trenches. This clearing has been a definite success. A good cover of tea was established in about 4 years and the yields anticipated this year will be in the region of about 1,800 lbs. for most of the clones, as against a yield of about 1,000 lbs. per annum from the original seedling tea in this field.

Encouraged by this success the same replanting scheme was put into operation in No. 1 field, where the annual yield had previously been of the order of about 550 lbs. The results here were very disappointing for the first 2 years, and the expenditure incurred was so heavy that it is to be doubted whether the replanting of this area was an economically sound proposition. The growth of the clonal tea here has been much more encouraging recently, but whether the expenditure earlier incurred is justified is a matter of controversy.

A detailed examination of the two areas shows that No. 10 area had been under tea for about 20 years, while No. 1 field had originally been planted in 1885 and had possibly been under coffee previously. An analysis of the soils in the two fields has shown that No. 10 field is rich in organic matter and the soil firm in texture, while soil in the No. 1 area was low in organic matter and of a powdery texture and liable to dry out much faster, indicating a deteriorated soil with low fertility and no crumb structure.

Various other adverse factors contributed to the poor results in No. 1 field. The area is steep and badly windswept particularly during the South West Monsoon. Much damage was caused by winds following a spell of dry weather when even well-grown plants tended to be seriously shaken up and sometimes uprooted on account of the poor structure of the soil. In fact the conditions prevailing in the No. 1 clearings with reference to the essential requirements of soil fertility, lie of land, exposure to wind, freedom from root diseases, etc., have been far from favourable for the successful replanting of tea.

Perhaps the 2-year period of rehabilitation of this area was also not long enough. The uprooting of the tea here had been done by a powerful winch, which operation had disturbed the sub-soil to a depth of 4 to 5 feet. The subsequent trenching of the tea rows would have caused more disturbance and exposure to the top soil. Until a good cover of Guatemala grass was established, which process takes about 1 year on a poor soil, the top soil was further exposed to alternate wetting and drying and the quantity of loppings that went into the trenches was perhaps insufficient to alter the soil structure. Under the poor conditions of soil and other adverse factors mentioned, it can be understood why these clearings made such poor progress during the first 2 years.

In view of these problems it is safe to assume that not all uneconomic tea land could be replanted economically or on the identical principles. Caution should therefore be exercised to see that land selected for replanting should not be too steep and not too badly exposed to wind. Areas to be replanted should have soils of at least reasonable depth and medium fertility, and should be free from root diseases and pests, such as celworm. If *Poria* has been known to be present in a field that is to be replanted, such areas should be treated before rehabilitation. It is also advisable before replanting is undertaken to have soil tests done for pH in areas where limestone is known to exist.

I shall now suggest certain modifications in the scheme of replanting in the light of our experience on St. Coombs, with a view to helping others to avoid or remedy the mistakes we seem to have made.

Rehabilitation

I have already suggested an extended period of rehabilitation but if this is considered impracticable, it is suggested that more generous applications of manure be given to the Guatemala grass to enable it to give back to the soil the large quantity of organic matter so essential to recondition the soil. Three applications of Guatemala manure at the rate of 4 cwt. per acre per application per year is the present recommendation. As an indication of the benefits of rehabilitation I should quote two areas in the No. 1 clearings which were replanted in 1954. One block of Clone 2025 which was rehabilitated for 2 years has yielded this year up to the end of October 1,118 lbs. per acre, while the other block which was planted without any rehabilitation with clone 2024, which is also a high yielder, has yielded only 572 lbs., though the applications of manure for both the areas and other treatments have been identical. One or two small patches in the latter area had to be uprooted again due to the incidence of *Poria*, but the beneficial effects of rehabilitation are obvious in the high-yielding block.

Trenching

Trenching of the future tea rows before rehabilitation is now not recommended and might profitably be avoided to minimise the ill-effects of soil exposure and consequent loss of organic matter and also to avoid the formation of terraces of loose soil which tend to break up later and damage the young plants. The Guatemala grass could be lopped and used as a surface thatch rather than as material for filling the trenches. Holing or trenching, if necessary, could be done just before planting the young tea.

Planting Distance

A mistake we seem to have made in the No. 1 clearing on St. Coombs which is steep land, is to adhere strictly to the recommended spacing of 5 feet between the rows. The soil being poor here the growth was slow with the result that until a perfect cover of tea was established a larger surface of soil was left exposed. On such land therefore it is perhaps advisable to adopt a closer spacing than the present distance of 5 ft. \times 2 ft. A planting distance of $4\frac{1}{2}$ feet \times 2 feet or

4 feet \times 2½ feet will perhaps offer more protection against wind, erosion and exposure of the soil. It is conceded that under normal conditions of soil and lie of land, a planting distance of 5 feet \times 2 feet is desirable both from the point of view of obtaining a reasonable density of bushes and affording sufficient space between the rows for subsequent operations of cultivation, harvesting, etc. But the close planting is suggested in exceptional cases of low soil fertility and exposure to wind, more with a view to the early establishment of the young plants against heavy odds. Moreover, by the selection of clones with smaller frames and subsequent judicious pruning, closer planting could be undertaken without detriment to subsequent cultivation operations.

V.P. Supplies

A number of estates are now well versed in the methods of growing healthy V.P. plants in nurseries. But I would like to emphasise that only well-grown healthy V.P. plants will thrive on a rehabilitated soil. It is therefore suggested that the best soils be used in nurseries, after fumigation against eelworm if necessary, and only the best basket plants are put out in the field, using the weaker ones as hedge plants above drains and road sides. The use of balled plants has proved a failure, while transplanting with a Hersall transplanter has been a comparative success.

Trenching and Manuring

One of the more serious mistakes we seem to have made, though unavoidably due to lack of material, is that since the young clonal tea was planted, the soil was left bare without any thatch for over 2 years, with the result that the exposure may well have reduced the benefits of rehabilitation. It is, therefore, advisable to plan ahead and have sufficient thatch available in an adjacent area to keep the clearings continually supplied with material for thatching. Uneconomic tea land which is not suitable for replanting could well be uprooted and put under Guatemala grass for this purpose. We have also found that the application of compost and well-rotted cattle manure has helped considerably the establishment of young plants on poor soils. It is also our experience that plants grown in this type of soil benefit more from regular applications of Sterameal 'A', rather than the T.175 mixture we have used in the past which tend to kill some of the roots if supervision during manuring is insufficient. It is therefore more beneficial to use Sterameal 'A' until the plants have been about 1 year in the field.

Bringing into Bearing

The method of bringing the young tea into bearing by thumb-nail pruning till the young plants have thrown out sufficient branches and then cutting across to a plucking level has proved a failure in a clearing with poor soil. Bending over and pegging down when the plants are about 1½ feet high and of pencil thickness has proved more successful. This practice has promoted quicker root growth and a quicker cover is established, if the new lateral branches are bent over repeatedly and one or two branches showing a tendency to shoot upwards are cut down to about 4" from the main stem.

Shade Trees

We have also noticed that the establishment of such green manure trees as dadap and albizzia was a slow process in the No. 1 clearings, although the soil was reconditioned. Under such conditions we have found that *Sesbania cinerescens* has grown vigorously even in the No. 1 clearings and has afforded sufficient shade and

protection from wind until the commoner varieties of shade trees have established themselves.

Finally it has been observed that certain clones have established themselves better on poorer soils than others. These are only observations and it will be many years before they can be proved and accepted as conclusive. For instance, clone 2024 has shown a marked inability to adapt itself to the adverse soil conditions in the No. 1 area, while clone 2025 and 777 seem to have done comparatively well, though growing on adjacent blocks. Perhaps some of these blocks are more sheltered from wind than others, but the adaptability of some clones to certain soil conditions is well worth further study and observation.

THE ECONOMIC ASPECTS AND PROBLEMS OF REPLANTING

Gordon K. Newton

At a Conference held during February 1955 attention was drawn by a number of scientists associated with the T.R.I. at that time to the age of a considerable area of the tea planted in Ceylon, the deterioration in condition of part of the area in question, and the fact that research at the Institute's estate, St. Coombs, had established the fact that tea (*Camelia sinensis*) may be grown successfully from cuttings taken from proven mother bushes, certain strains grown under suitable conditions being capable of yielding at far higher levels than had been obtained from any known area of tea planted with seedlings. The practice had become commonly known as vegetative propagation. **

The Scientists having focussed attention on the importance of maintaining or improving the capital value of the 570,000 acres of tea planted in Ceylon, representatives of the Government then urged that the discoveries at St. Coombs should be actively exploited by business interests, in fact particular impetus was given to the subject by the Governor-General, Sir Oliver Goonetilleke, who in his opening remarks, at the 1955 Conference amongst other things, stated:—

“How many of you have plans for replanting areas of old tea with vigorous, high-yielding, high-quality material? In the Tea Control Year 1953/54, only ten acres were replanted. I know your answer—‘new planting or replanting is all too expensive.’ But is it too expensive when you remove the incidence of costs of a new factory and of additional accommodation for labour? Is it too expensive when you consider that the yield per acre, if planted with clonal plants produced by methods of vegetative-propagation, is certain to be well over 1,200 pounds per acre? All of us must listen very carefully to Mr. Portsmouth's paper this morning. You will see in this study a challenge to the industry and to the Institute. The former arises from the fact that the cost of production of tea is based directly on the yield per acre and that the rising cost of production can only be met by increased production. The challenge to the Institute lies in their responsibility to educate the working planter and to provide planting material suitable for all areas.”

On making enquiries recently I find that the position in respect of Tea Replanting has not progressed much during the intervening 3 years.

I have to acknowledge gratefully, costing details from many sources; replanting in Ceylon is still restricted to a few acres annually and the cost of the work undertaken shows a wide variation between Rs. 2,500/- and Rs. 6,000/- per acre. In many cases the efforts have not been entirely successful. This all goes to show how essential it is to have for guidance the experience of those who have replanted successfully.

As illustrated three years ago production costs from a large area of tea at present under cultivation continue to make them uneconomic to keep in production for a market which, since bulk purchases ceased in 1947 including two boom periods the average price paid at the Colombo Auctions for the 11 years has been—

		Rs.
Up-country	(4,000 ft. elevation upwards)	2.16
Mid-country	(2,000 ft. „ to 3,999 ft.)	1.84
Low-country	(Sea level „ to 1,999 ft.)	1.90
Total all sales weighed average		1.95½

It was indicated then that an acre of tea may be uprooted, the soil rehabilitated for several years, replanted with selected clonal cuttings and brought to bearing again at a high yielding level on a cycle of 6–10 years under circumstances fairly well comparable to the areas under test at St. Coombs. The estimated cost would be in the region of Rs. 6,000/- per acre and the question was posed as to how, with the narrow margin between production costs and sale prices over the years, those responsible for the fortunes of large numbers of shareholders as well as individual planters could embark on any large scale very expensive replanting. Work from current profits seemed out of the question even then following a boom year 1954 when all teas sold in Colombo averaged Rs. 2.56 per pound, compared now with a Colombo average of Rs. 1.74 for all teas sold to the end of October 1958.

At that time it was stressed that if the tea industry was to prosper in maintaining and improving not only the equity of Tea Company shareholders and proprietors but the chief source of revenue of the Island, then some encouragement should be given by the Government which fundamentally is most concerned of all.

That view was accepted by the Associations representing the Ceylon Tea Industry and schemes were drawn up embracing the policy of replanting on the expectation of assistance from the Government in the form of rebate from the export duty levied on each pound of tea exported from Ceylon.

Since the Conference of February 1955 and subsequent negotiations, profound changes have taken place, those now responsible for the general agricultural policy of Ceylon recognised the advice given by our research scientists, but, instead of lifting the burden of an export duty which is severely handicapping the marketability of Ceylon tea in consumer countries, have made the task for the producer more onerous by the imposition of an additional export duty levied under terms of the Tea Subsidy Act No. 12 of 1958.

Briefly, at present the Act provides for the collection of .04 cents per pound on each pound of tea exported from Ceylon. The buyer/exporter pays the duty but in purchasing tea from the producer the buyer in Colombo discounts the amount of duty from the price he is prepared to pay on a world market, and in the case of producers consigning their tea for sale elsewhere the levy is a charge at the point of export from Ceylon.

Thus we are presented with a picture of an agricultural industry of which two-thirds is at present struggling for existence faced with the burden of an additional tax collected for:

1. the replanting of estates and small holdings,
2. the rehabilitation of estates and small holdings,
3. the marketing of green tea leaf of estates and small holdings,
4. the manufacture of made tea from such green tea leaf.

For the purpose of consideration at this symposium, we are chiefly concerned with No. 1 'The replanting of estates and small holdings'—and in this respect regulations have been framed through the Tea Control Department for payments from the Tea Subsidy cess to estates undertaking replanting.

The amount of the subsidy payable for replanting shall be Rs. 2,500/- in respect of each acre of the area replanted, and shall be paid in six instalments. The target figure for the proposed replanting is 30,000 acres or 1 per cent. of large estates a year for 6 years. The period over which the instalments may be paid will to a great extent be governed by the soil rejuvenation period. The period envisaged will be six years — it may take longer, perhaps up to 10 years.

It seems likely that those participating will wish to replant the most impoverished and lowest yielding areas which will probably require longer periods of rejuvenation. Instead of a total replanting period of 6 years it seems more likely that a fair average of 8 years will be required.

Unless it can be seen that the proposals include sufficient encouragement for replanting to be started in a big way, then the intention will fail and the more efficient section of the industry will find it financially impossible to replant large areas, but will be compelled to provide a large amount in cess for work of unknown value.

The amount of rebate payable to those who replant is fixed at a maximum of 6 per cent. of the area of large estates in production at Rs. 2,500/- per acre, but the estate contributes according to its yield thus—

- | | | | | | |
|--|-----|-----|-----|-----|--------------|
| 1. An estate of average size — 700 acres having a yield of 500 lbs. per acre — contributes to the fund Rs. 20/- from each acre annually or | ... | ... | ... | ... | Rs. 14,000/- |
| 2. An estate of the same size with the average yield of Ceylon tea — 700 lbs. per acre — will provide from each acre Rs. 28/- or | ... | ... | ... | ... | Rs. 19,600/- |
| 3. A fairly high yielding estate of the same acreage at 900 lbs. per acre will provide Rs. 36/- from each acre annually or | | | | | Rs. 25,200/- |

Assuming the period occupied for replanting takes 6 years, No. 1 will provide for the State	Rs. 84,000/-
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And if full advantage of 6 per cent of the area for replanting is taken receives rebate for 42 acres × Rs. 2,500/-	Rs. 105,000/-
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The amount received for replanting will be in excess of the cess paid by	<u>Rs. 21,000/-</u>
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No. 2 will provide	Rs. 117,600/-
and receive	<u>Rs. 105,000/-</u>

In this case the estate will have paid in cess more than the maximum it will be allowed for replanting by	<u>Rs. 12,600/-</u>
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No. 3 will provide	Rs. 151,200/-
and receive	<u>Rs. 105,000/-</u>

In this case the estate will have paid in cess more than the maximum it will be allowed for replanting by	<u>Rs. 46,200/-</u>
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Taking the three estates together as a fair cross section, the State receives from cess Rs. 352,800/- and pays a maximum in subsidy Rs. 315,000/- putting Government in credit by Rs. 37,800/- from only 2,100 acres. In other words the Industry will pay approximately Rs. 18/- per acre more than the maximum it could receive in subsidy over 6 years or Rs. 3/- per acre annually.

Over the total acreage of large estates this represents 6 years \times Rs. 3/- \times 500,000 acres = Rs. 9,000,000/- if all estates claim the full subsidy. If only say 50 per cent. of the large estates replant during the 6 year period up to the limit, then the gain by Government from the cess will be Rs. 18,000,000/-. But is it likely even 50 per cent. will replant ?

An efficiently run estate such as example No. 3 provides Rs. 151,200/- for the replanting fund but the maximum rebate is Rs. 105,000/- amounting to a difference of Rs. 46,200/- in this case being the penalty of efficiency.

Put another way—say the 500,000 acres of large estates provide for export 350,000,000 lbs. they will in one year contribute Rs. 14,000,000/- and over 6 years Rs. 84,000,000/-. The maximum rebate claimable will be 6 per cent. of 500,000 acres @ 2,500/- = Rs. 75,000,000/-.

The surplus contribution to the State is Rs. 9,000,000/- being a similar figure to the detailed illustration and the same principle applies—is it likely 100 per cent. will replant, 50 per cent. or 10 per cent. ?

If the rejuvenation period requires more than 2 years as allowed for in the regulations, and from data obtained from various sources it would appear to require a longer period to rejuvenate soil that has carried a mono-cultural crop for possibly 80 years, then the provision by the Industry for the State is greatly increased. For instance, should the overall period on an average for replanting found to be 8 years instead of 6, on the basis of 30,000 acres replantable the surplus provided by the Industry will be Rs. 49,500,000/- provided all estates replant and should only 50 per cent. avail themselves of the opportunity the surplus will be Rs. 80,750,000/-.

If estates do not replant they lose the subsidy benefit. If estates do replant they must find capital for an additional Rs. 2,500/- or more per acre to complete the work, and during the period of replanting lose the income from the tea uprooted in cases where the old tea is not completely uneconomic.

Let us look at the situation from the taxation angle as affecting shareholders.

Assuming land is available for development and it is desired to plant new areas, the capital required will be Rs. 4,000/- to Rs. 6,000/- per acre according to circumstances. I will leave out complications of providing buildings and machinery. Allowing for taxation at the present level approximately double the amount will be required from profits to provide for the work. Rs. 8,000/- to Rs. 12,000/- an acre is a capital sum of such magnitude as to dissuade any Board from contemplating extensions with the price levels ruling now.

What prospects could there be under the Tea Subsidy Act ? We shall hear what planters have to say about the chances of success by replanting in various districts and likely costs to be faced under the varying circumstances. Up to

Rs. 3,500/- may be required above the rebate payable per acre. The work being chargeable to revenue—approximately half the amount needs to be found from taxed profits. Is it likely shareholders will encourage such expenditure ?

It seems that Government has realised that present day high costs of new plantations preclude the *entrepreneur* from utilising fresh capital and consequently offers some encouragement for replanting under the terms of the Tea Subsidy Act, in its apparent benevolence utilising the Industry itself to contribute part of the cost, and chiefly at the expense of that section most likely to undertake progressive work.

This cess of .04 cents per lb. plus an expected charge amounting to .06 cents per lb. for the proposed provident fund will raise costs of production to such a height that it will be impossible to undertake replanting in any large scale with the proposed level of payment. The regulations must provide for a more generous rebate from the Tea Subsidy Scheme for replanting successfully undertaken, or we may expect the proposals to fail. This requirement applies particularly to the area of 380,000 acres comprising the mid and low country tea areas.

Some say the whole conception of tea replanting in Ceylon is premature and sufficiently reliable material is not yet available, others say we are starting 10 years too late. Maybe the latter are right in the light of political and cost trends over the past 10 years.

QUALITY IN RELATION TO CLONAL VARIETIES

T. Kane

(Forbes & Walker)

Now that it is no longer possible to issue an official gin before lunch organisers get worried for fear they may get ahead of the clock. I think perhaps that is why I have been allowed to creep into the bill with this delightfully vague subject "Quality in relation to clonal varieties."

It has been very interesting seeing the development of vegetative propagation and the way the difficulties of preparing tiny quantities of leaf have been overcome so that it has been possible to assess the quality of the tea bush would produce before its development was undertaken on a big scale. But since these speeches are meant to start an argument I will begin with a question which I hope will be answered at the end. How did it all start? I know that gardeners are continually taking cuttings of this and that and expect them to grow but I am assured by my father-in-law who planted out here for many years that the planters of his day tried again and again but could never get cuttings of tea to strike. Of course everything strikes much more easily in Ceylon now, but I should like to know how it was done.

When the first series of experimental samples were examined it was a shock. We found it hard to believe that a tea known to preserve a consistent character throughout the year could really be compounded of such diverse elements. We suspected the miniature manufacture of failing to develop the tea but in fact as the experiments continued the truth was confirmed. The variety was amazing. It certainly impressed on us the need for vegetative propagation (I hope I haven't got to say that word again) as there seemed little chance of finding any area where selected seed bearers in any quantity could be protected from cross pollination.

To return to the clones, most planters naturally selected their best looking bushes for experiment but the T.R.I. with a more scientific interest worked on a wider sample. In groups of 8 or 12 they sent them down for examination and we found that in the same days teas made under identical conditions one was flavoury but light, another coloury with useful quality and yet another coloury and quite plain. Some were thin and green and some had peculiar horrible tastes of their own like resin or cabbage. In addition one or two refused to ferment at all and came out with a leaf green infusion and thin yellow liquor. It was noticeable that of two equally attractive teas one might have a bright but greenish infusion and one a bright reddish infusion. Perhaps it is not always the planter's fault when his infusions are mixed.

Resistance to disease was of course very much in the minds of the T.R.I. in their selection particularly at that time in respect of Blister Blight. A long process followed of sorting the clones and checking their quality throughout the year as naturally they show seasonal variation just as do estate teas.

There were a good many disappointments. A planter would submit a clone, a beautiful vigorous bush yield estimate 2,000 lbs. to the acre at least, never known a

day's illness and completely resistant to Blister. Back would come the taster's Report "Dull green coarse liquor. Infusion Dark."

On the other hand the tasters would get enthusiastic about another sample and look for new superlatives "Intense flavour deep colour and rich quality" and back would come the T.R.I. Report "Average yield 400 lbs., riddled with eelworm, shot-hole borer in every twig, defoliates in January."

At the end of this process we had reached a stage where a number of planters had good selected clones of their own with which they were supplying vacancies and opening small areas, and the T.R.I. was able to offer material from proved clones to those who wished to start their own multiplication plots. It must be remembered that these things can't be hurried. Before you can put out a substantial number of plants you must select your clone, prove it, and multiply it; a process of years. It is because of the time involved that we can't be sure yet that we are doing the best possible.

In the case of the individual estate the planter knows that he is putting in high yielding material which is well up in quality to the normal standard of his estate. And the question is "Could he *raise* the standard of quality with a different clone, even if he had to put more bushes to the acre?"

In the case of the T.R.I. they know they are offering high yielding clones which are of excellent quality in the Dimbula District. And the question is "Are they going to be equally successful in other districts?"

Investigation was started by planting up different clones in various districts and this year when the bushes had reached maturity we saw some samples which opened up the most interesting speculations. Twice during the Uva season we were sent a range from experimental plots of T.R.I. clones planted in an Uva District, I am not sure of the estate. I think it was in Passara and at any rate it was not up to the 4,000 ft. level.

In the first place all the samples were better than one made from the normal estate leaf. In the second all had acquired Uva character but with remarkable varieties.

No. 1294 produced a tea like a fine Udupussellawa.
Light pungent and full of flavour.

No. 1526 was a little less flavoured but still suggestive of that District or of the top of Haputale.

Both of these, I think, had been rather light but flavoured in Dimbula.

On the other hand 777 which in normal life is a good quality Dimbula with useful colour had turned into a strong coloured Badulla type with enormous pungency though no great flavour.

One can't draw conclusions from two tastings but it does suggest that it is possible to raise the quality of an estate's tea by planting selected clones. Also that the clone will retain its essential characteristics even though affected by conditions in its new area. I suppose it must do so because it is a clone.

What about the Low-country then? Can we do something to raise the standard of their liquors by planting selected clones? It might be important to do so at this stage.

Bill Flindall who probably did more than anyone else to raise the standard of the manufacture of Ceylon low-grown tea and make it suitable for our present markets always maintained that however bright the liquor of a low grown tea you never got away from a trace of an essential coarseness which prevented it having quality. I agree with him. But again, this year we saw a series of samples from clones planted in the low country. The experiment was vitiated to a certain extent as the leaf was taken up-country for manufacture and that affects the result. None the less 2023, 2024 and 2026 definitely had quality and were far more useful than the best low grown tea has ever been. It seems hardly believable that the improvement was entirely due to special manufacture. Would this quality persist or would it fade out in a short time under low country conditions ?

All these matters are still in an experimental stage and wholesale replanting is being urged on us. I am certainly not going to tell the agriculturalists what to do but I would just like to finish with one or two questions for them to answer.

First. Is the replanting of whole blocks needed ? We see the total Ceylon crop going up year by year without any significant increase in acreage. That is to say yields are increasing. Anyone who goes through the tea districts can see that most soundly managed tea is looking better than it ever did before. Can much of the existing tea be built up to yield nearly as much as clonal tea without the long delay and risk of replanting ?

Second. Is replanting in fact being done ? Every year most estates seem to have a vote for supplying. For the past 10 years a lot of the supplying has been with vegetative-propagation material. In some cases it has been the habit where there was a gap with some scruffy bushes round it to have them out and plant up the whole patch. Now unless these supplies go into the same holes each year there must have been a slow process of replanting going on over the years. How far has it gone ? And is it responsible for our increasing yields ? Ought we not to know more about the facts before we rush at it ?

Superficially it sounds attractive to say "Select two or three good clones which will reinforce the quality of your estate's teas and improve the deficiencies in their liquors. Use them to replant your poorer yielding areas."

But do we know enough yet about the clones ? And don't we know too much about the land ? Are the areas which give low yields now going to give high yields when replanted or are they unsuitable for tea or just worn out.

I am much in favour of pressing on with clonal planting but I think we should find out first whether it is possible to use it throughout the estates as a replacement rather than in the long and expensive method of replanting whole areas. I am quite sure there is no good putting good clones into worn out soil.

SELECTION AND QUALITY

E. L. Keegel

The assessment of quality of different bushes started nearly 20 years ago at the Institute, and I believe what led to it was the examination by Dr. Tubbs of the number of shoots plucked per bush. These observations went to show how dependant on a relatively small number of bushes an estate is for its crop. The logical sequel to these findings was the selection of mother bushes for vegetative propagation and micro-manufacture naturally followed.

It is unnecessary to go into details of the methods employed in bringing out the inherent characteristics of each bush tested, but it became evident as time went on that no two bushes produced the same type of tea. The results gave much food for thought and just as we may say that on an average estate its yield comes from a small proportion of its bushes so does its quality. Our approach to tea manufacture was thereby radically altered and no longer can it be said now that the poor results in one factory or the good results in another are entirely due to some fault or special skill in manufacture.

I have just returned from a tour of the tea areas in the Soviet Union and Assam much impressed by the emphasis these countries are placing on quality. We in Ceylon are unfortunately relying too much on the climatic conditions in this country favourable to the development of this characteristic in our teas, but not all estates have this advantage. So unless we make a start now on replanting with the right material, I do not anticipate a bright future for Ceylon tea. More important than new machines or reducing cost of manufacture is the quality factor, and however modernized our outlook may be we cannot get away from the fact that no machine can improve the quality of a tea to the same extent as what would accrue from proper selection.

Now how is this to be achieved? My personal view is that there are no shortcuts, at least none at present, although our friends from India might say that pubescence of the leaf is related to quality. But then it should be remembered that they are dealing with a different type of quality from what we know of it in a Ceylon tea and in any case this relationship holds good only for Assam leaf grown under different conditions from ours. Nevertheless, hairiness of the leaf may be one method of basing selection in low-country areas since obviously it would improve tip in the tea. Yet judging from the rapidly changing requirements of the tea drinking public, appearance of a tea might very well cease to be of such importance as it is to-day. So having an eye for such changes in the future I would say that even in the low-country liquoring properties should be the primary consideration in selection work.

Admittedly, as far as quality is concerned we have specific knowledge only of a few T.R.I. clones but at the same time we are aware of some really promising clones elsewhere. We also know that some of our clones have reproduced their inherent character at other elevations though not of course to the same degree as when grown at St. Coombs. Assuming these clones can be successfully established in other areas, an estate will have nothing to lose by replacing uneconomic bushes with the little material at our disposal. But if we are to replant on a larger scale

we must naturally take the greatest care in selecting the right clone with the right type of quality, for the particular area in which it is to be grown.

It is clear that much more work has yet to be done before we can embark on a large replanting programme. On the manufacturing side we should make an intensive study of as many clones as possible from those selected so far for their physiological properties. If a start is made now we can get at least a partial answer within the next two years. The Institute cannot obviously undertake a task of such magnitude, but if estates would co-operate by conducting their own tests progress would undoubtedly be rapid. But to get successful and conclusive results the work should be done systematically and over a period of at least one year. The technique to be adopted and the precautions to be taken have been dealt with fully in a *Tea Quarterly* publication. A mincing machine and a single tray drier are all that is required to get the essential preliminary data on the manufactured teas. Once this information is available it is a simple matter to reject the undesirable taking yield and other factors into consideration.

The final stage in selection is the manufacture of the clones in properly designed miniature machinery. A start in this direction with a view to extending our activity in vegetative propagation has been made. We are in touch with engineering firms both here and abroad regarding the manufacture of small scale plant. We are even considering the production of a miniature drier of the tilting tray type so that the results could be held to be more valid on a factory scale. With six such units in different parts of the island and the staff to operate them we should be able to give more assistance to estates, but not all the assistance we should like to give them. The time has come now, I think, when estates should no longer depend entirely on the T.R.I. for quality tests. Hitherto a serious set-back to this work was the prohibitive cost of these machines but if large numbers are ordered they would be available at a reasonable price. It will be of great assistance, therefore, if we can tell the engineering firms concerned with the scheme the potential requirements of the industry.

Estates that have not yet started on clonal manufacture hardly realize what a vast and fascinating field remains to be explored. Bushes that produce teas distinctly inferior in quality to normal estate manufacture are sure to be discovered whilst at the same time it will not be hard to find bushes giving teas with features superior in every respect. That is not all. Types may be revealed with distinct and novel characters that would be immensely valuable and throw into the shade all other teas. Selection offers all this, but if we are going to be content with the use of only high yielding material for replanting we shall certainly be putting the clock back to the detriment of the future of Ceylon Tea.

REHABILITATION AND TEA DISEASES*

D. Mulder

Primary Root Diseases.

Red root disease (*Poria hypolateritia*), Charcoal root disease (*Ustulina deusta*), and Brown root disease (*Fomes noxius*) are the common primary root rots that occur in tea. Young plants, either of tea or shade trees, may be easily attacked and killed by these root diseases if they are planted out in a previously-affected area, especially when the soil is not properly cleared of infested woody material after uprooting.

In areas intended for replanting where patches of vacancies occur, dead or unhealthy bushes should be marked. These areas should be forked deep and all roots of both tea and shade trees dug out and burnt on the spot. Bushes could be uprooted by a winch, but care should be taken to remove all smaller roots of pencil thickness afterwards. Otherwise, these smaller roots would form sources of infection in the new clearing. The sites thus cleared should be put under a green crop such as Guatemala grass or *Tephrosia vogelii* (an indicator crop for Red root disease), for at least one year and preferably 2 years before replanting. Outside these patches of suspected root diseases, the winching of bushes and shade trees could be done with ease, as it is not necessary to take special care to remove all the smaller roots.

Phloem Necrosis Virus Disease.

Phloem necrosis virus has not yet appeared in plants supplied in old, severely-infected areas. Therefore, we have no evidence so far that any danger of infection is involved in replanting phloem necrosis areas with healthy material.

Thatching on Newly-Planted Tea.

It is a general practice to thatch new clearings with Guatemala or Mana grass. Experience has shown that thatching should be confined to the inter-row space and not be done around the collars of bushes, for when the thatch gets heated by the sun, the tissues at the collar region are killed resulting in collar canker. This alone is sufficient to kill the plant. It has also been reported that the fungus *Rosellinia arcuata* which causes the Black root disease spreads through thatch in new clearings.

Cover Crops in relation to Diseases.

Guatemala grass has been grown extensively for more than 10 years on many estates as a cover crop prior to replanting. It has a depressing effect on both root-knot and meadow eelworm populations and does not harbour root parasites. Infection experiments initiated at St. Coombs, to attempt the artificial infection of grass roots with portions of *Poria* infected tea roots, have conclusively proved that the grass roots do not serve as hosts for *Poria* root disease.

Tephrosia vogelii is susceptible to both root-knot and meadow eelworm and should therefore not be grown on eelworm-infested areas.

Marigold has a depressing effect on eelworm population, but has probably no effect on parasitic fungi. Marigolds could be planted as a cover crop between the rows of tea during the first year of growth, in previously-infested areas.

Crotalaria sp. is less susceptible to eelworm than *Tephrosia*, but is commonly affected by a leaf disease caused by the fungus *Parodiella grammodes* and a mosaic virus disease.

* A note submitted subsequent to the Symposium.

ADDRESS BY MR. M. J. GREEN, INDIAN TEA ASSOCIATION, TOCKLAI

In the first place I would like to thank the Tea Research Institute for their very kind invitation to attend this symposium. It not only gives Mr. Grice, who is our Advisory Officer in Darjeeling, and myself the opportunity to study the conditions of growing tea in Ceylon, but incidentally gives us both our first opportunity to see this wonderful island. Secondly I might say how pleased we were not very long ago to see your Mr. Kehl and Mr. Keegel at Tocklai and I only hope that that will not be the last of such visits and that we will see more of the Tea Research Institute representatives at Tocklai in the very near future.

I am further greatly honoured by being asked to add something to these proceedings, a task which has been rendered more difficult by virtue of the eloquence and of course the local, and therefore topical, knowledge of those who have already spoken. It has been extremely interesting to-day and I only intend to say one or two very short words in addition; in fact there is not very much left for me to say.

Until relatively recently tea estates in North East India were planted with what we might call hardy jats. That these jats were hardy is to be seen from the fact that some of this tea can even today be found in Assam, some of it a 100 years old. We are never content, though, and popular demand has, most especially through the efforts of seed concerns, or the larger seed concerns, resulted in the production of jats of greater uniformity and enhanced quality. Undoubtedly hardness has suffered; these jats do not have the life expectancy of the former jats. On top of this we have the problematical effect of increased offtake of vegetable matter consequent upon the increased yields due to closer spacing and the increased applications of fertilisers. Under these conditions we can no longer expect to be able to plant out even new areas and expect these areas to keep going for 100 years.

On replanted areas this state is likely to be accentuated. We now talk in terms of 40 year planting cycles and of $2\frac{1}{2}$ per cent. annual replanting programmes — that is with the existing jats. But what about clones that are specially selected for quality and likely to have even less hardness than existing seed jats? Perhaps a 20 or 30 year rotation might be necessary. The rotation period is really immaterial provided the clones pay their way in that period. People, after all, are not going to use clones unless they do pay their way, so you may expect clonal replanting to increase in Assam and North East India generally as undoubtedly those estates first off the mark in the clonal race will reap handsome benefits, and other estates will not want to be left behind.

At Tocklai some 10 years ago we released the first of our vegetative clones to tea gardens — 3 of them. We are now about, as you heard from Mr. Kehl this morning, to release another 8. These are of various kinds; we have what we call our standard clones which only have a certain increase in yield and a certain increase in quality above our control seed jat. Some of them are what we call yield clones, which have very high yields but not necessarily high quality. Some of them, on the other hand, are what we call quality clones with extremely good quality, getting very high prices, but not necessarily outstanding yields. Simultaneously we have encouraged companies to start off their own selection schemes, and have given them

details as to the best practical methods for doing this. Already several estates and companies are in a position to plant out large acreages with clonal tea, partly Tocklai clones, partly their own clones. We can readily discern hesitation to plant out clones to the full capacity of a garden, but now that a few are really taking the plunge, we may expect many more to follow:

At the same time as clonal work has progressed, we at Tocklai have been raising progenies from clonal seed baries. One such progeny has already found favour with the planting community even though we ourselves do not think that this particular progeny comes up to our rather exacting requirements. Several of the parent baries of this clonal seed jat are already out on estates and some of them are already producing their first seed. There is one further progeny under district trials. Other progenies are awaiting district trial as soon as we can get seed baries of our own put out. It is to be hoped that it will be possible to raise progenies from clonal seed baries which possess the outstanding quality and vigour currently being sought in clones but which will also have the attribute of hardiness.

Undoubtedly our main problem has been the encouraging of tea concerns to take up these new ideas. The most we can say is that vegetative propagation has been ignored on most estates, dabbled with by a very large number of estates, tried out reasonably properly by a very few, and what I'd call pursued to the bitter end by only one or two. There has of course been no compulsion behind clonal planting. Perhaps had there been insistence at the appropriate levels we might now see many hundreds or even thousands of acres of clonal tea in North East India. In fact as I have already told you today there are just about three or four hundred acres of clonal tea in North East India at present.

We are all seeing new opposition entering the tea market on an ever increasing scale. We cannot, in my opinion, make their kind of tea as cheaply or as profitably as they can. Fortunately they, so far, can't make our kinds of tea. In all our areas we can profitably replace much of our tea by more appropriate jats. The methods and the means have been developed here and in India for doing that, so let us all make the best use, then, of what these methods provide.

Well gentlemen, that is all I had planned to say, but there is a question that keeps coming up concerning replanting in Assam — that we replant areas yielding 1,200 lb. to the acre. I think I had better go into this a little bit further as it is not just the fact that these areas are yielding 1,200 lb. per acre that makes them due for replanting. After all there are other considerations. I have seen areas which are yielding much more than that, indeed 50 per cent. more than that, being uprooted, and the reason for that is because those particular jats with which these fields or sections were planted were what you might call low cast jats; they required about two or three times the number of pluckers per acre to pluck compared with better jats, and the leaf was not of good quality and did not make good tea. No matter what your yield is under these conditions you are not going to keep these jats when there are better available.

As far as the treatment of infills is concerned, I think one has to bear in mind the age expectancy of any given planted section. You can draw a graph of the appearance of vacancies. To start off with you plant out any given acreage; within the first year you are probably going to get a number of deaths. Those are just accidents in planting. After that you'll get a steady stage, where you get very few vacancies if any, but at some stage in the future you are once again going to see your vacancy rate increase. You never know when that might come. As I said about the previous Assam jats, we have still got them going even though they are

over a 100 years old. The only reason why they are being replaced is because they take too many pluckers per acre and do not make good tea. In our present jats that we are going for now, we expect that stage where you get a sudden increase in the number of vacancies to turn up when about 40 years old. One can infill or supply up to that time, but the time will eventually come when the rate of supply or the rate of infilling will be uneconomical. The only thing to do then is to replant. Well gentlemen, I have nothing more to say to you. If there are any questions you would like to ask, I shall be willing to answer them, and any questions about Darjeeling conditions which are more akin to your conditions here, I am sure Mr. Grice will be only too willing to answer.

ADDRESS BY MR. W. J. GRICE, INDIAN TEA ASSOCIATION, TOCKLAI

You have heard a fair amount about replanting and rehabilitation in Assam from Mr. Green. As conditions in Darjeeling are so very different and more similar to your up-country estates I don't think it would be out of place to add a few points about replanting and rehabilitation in Darjeeling.

Tea was first planted in Darjeeling in about 1840 and most of the tea seen in Darjeeling now was planted between that date and 1860. This means that our tea is considerably older than any of yours and even though this is the case, little or no replanting has been done and the acreage of tea under 20 years is very small. The reasons for this are that there is no suitable seed or clonal material available for Darjeeling, so you can understand a Garden Manager's reluctance in uprooting tea producing the tea that Darjeeling is famous for and replanting it with either clonal or seed material that is unproved. It will be noticed therefore that, when selecting for both clones and seed, flavour is considered of primary importance. Economics also play an important part in replanting, for it has been estimated that it costs just to uproot and prepare the land for replanting about Rs. 4,000; the main reason for this is that everything has to be done by hand for mechanisation due to the configuration of the land is out of the question.

You may wonder then what sort of rehabilitation is done to keep the tea in Darjeeling producing economically. The technique that is adopted is what I like to call a rehabilitation prune. As soon as the tea becomes hide-bound, shows a mass of twiggy growth in the upper part of the bush and produces small leaves, resulting in a fall of crop — in fact, as soon as it becomes uneconomic — the tea is pruned at ground level. This may sound drastic but it must be remembered that most of the tea in Darjeeling is of the extreme China or China hybrid type and this has a mass of stems arising from ground level, so pruning in this way does not mean cutting into very heavy wood; so long as the tea is looked after in the recovery years it comes into bearing in 2 to 3 years time and yields anything up to twice and much as it was before. A great deal of the new wood in a prune like this grows up from below ground level so the planter is virtually replanting without having to uproot and is at the same time maintaining the stock that gives the famous flavour.

I am not suggesting that this method is the only way of rehabilitation and in fact as the tea grows older it appears that rehabilitation prune has to be done more frequently — recovery takes longer and there are more deaths. Therefore uprooting and replanting in Darjeeling must soon be started if the district is to carry on producing tea economically. That this is true can be seen by the fact that the yield is very low, the district average being only 320 lbs.; the costs are high — it is not uncommon to find tea costing Rs. 3.00 per pound to produce.

A certain amount of work has been done by some of the local planters in the V.P. field but as yet no really flavoury clone capable of giving high yield has been found. It will be appreciated that finding a flavoury clone is a slow and tedious process in the absence of any taxonomic feature on which to base selection. Tocklai has been working on this problem and we are confident that shortly we will be able to considerably help the planter in selection for flavour.

Finally, Mr. Chairman, I should like to reiterate Mr. Green's thanks to the T.R.I. for their kind invitation to attend the symposium and to say how very interesting I have found both the papers and the discussions. I am very much looking forward to seeing some of your estates and learning a little about how tea is grown and made in Ceylon. I should also like to extend an invitation to both officers of the T.R.I. and planters that, if and when you visit India, you come to Darjeeling and see for yourselves the difficulties under which we have to work and at the same time enjoy its unique beauty.

DISCUSSIONS

DR. VISSER'S PAPER

Mr. E. N. Whitfield.—In accordance with the Tea Rehabilitation and Replanting Ordinance, so far as Company Estates are concerned, it is necessary to use V.P. material for planting, and while not denying that high yields have been recorded from areas planted up with selected V.P. material, high yields have also been obtained with planting selected tea seed. There are companies who have developed tea seed bearers, at a great expense, from which can be obtained reliable seed, which is very suitable for planting up tea, and I consider an escape clause should be sought in the regulations permitting seed to be used at the discretion of the Tea Controller, where it can be established that yields from such seed have exceeded the minimum target of 1,600 lb. per acre referred to on page 10 of the 1958 Pamphlet "The Rehabilitation of the Plantation Industries" issued by the Ministry of Agriculture and Food.

Dr. Visser.—In the few instances where comparable areas have been planted with tea seed and clonal material, the latter gave 80 to 100 per cent more than the former. I am not against planting with seed, but until we knew more on the subject I would advise planting with V.P. material.

Mr. T. Kane.—If one bush in a plot gets diseased will the disease run into the whole plot?

Dr. Visser.—Some bushes may be more susceptible to a disease due to environmental conditions than others, but the chances are that every bush of the particular clone is liable to get diseased sooner or later, and as such I recommend the planting out of at least a dozen different clones, the number depending on the area to be planted. Regarding the estates referred to above, fields which were planted with a mixture of selected clones yielded much better than those planted with selected seed. Planting with mixed clones also reduces the risk that the entire block will succumb to the disease.

Mr. B. Mahadeva.—It is not a legal requirement that replanting should be done with V.P. material in estates over 100 acres, but I would suggest that it is better to plant with V.P. material till good clonal seed bearers are found.

Dr. Visser.—Especially low-country estates might be allowed, on our advice, to plant at least a certain area with their best selected seed as this will give us a comparison in about 4 or 5 years as to whether bushes raised from seed give yield and quality comparable to that obtained from V.P. material.

Mr. F. H. Kehl.—Whether seed or cuttings are used in replanting, attention should by no means be confined to yield alone. The quality of the tea produced is just as important as yield. In North East India estates use seeds that are known to produce high quality teas. In Ceylon, however, no seed bearers are known to produce such seed. At the present moment clones selected for quality have always produced better teas than seedlings.

Mr. V. G. W. Ratnayake.—Many estates have fairly high-yielding selections, but the Institute has not checked these for yield or resistance to blister blight and mites. I wish to know whether the Institute had any plans to test these clones with regard to yield, quality and resistance to diseases and mites.

Dr. Visser.—The T.R.I. has not and cannot test all the clones in the Island unless we double our staff, which would not be a bad idea. I agree that some appraisal of the characteristics of these clones should be done, but this aspect will be dealt with by Mr. Mahadeva later on. I would add that many planters have co-operated with the Institute and I hope they will continue to do so. A certain amount of testing should be done by the planters themselves, *e.g.* it is very simple to observe whether a selection is attacked by blight or insect pests and reject it on that score. At the moment the T.R.I. has 55 clones under test for blister resistance and most probably in the near future we will have another half a dozen high-yielding clones with many desirable characteristics.

Mr. K. J. Ratwatte.—Does fumigation entirely kill eelworm ?

Dr. Visser.—Fumigation is more or less effective against eelworm, depending on the conditions at application. However, it will cost about Rs. 800/- per acre, and since the yield of old tea affected with eelworm is already marginal in most cases, it is hardly necessary to point out that fumigation is not (yet) an economic measure of control. Fumigation of nurseries is essential. It may have been noticed that we are reluctant to test nursery soils for eelworm. If we test every nursery soil the whole research staff will be engaged on this. Accordingly it is easier for us, and better for you, to fumigate all nurseries.

Question.—Has the T.R.I. any clones selected for the production of crystal tea ?

Dr. Visser.—No, but it may be a consideration for the future.

Mr. R. A. B. Gottelier.—Is it a fact that V.P. plants are more susceptible to virus disease than seed ?

Dr. D. Mulder.—There is no reason to suspect that V.P. will be more susceptible than seed especially since most of the selections are high jat material. It is the low jat tea that is very susceptible to virus diseases.

Mr. R. D. Wedd.—On the question of the appointment of a tea taster for the T.R.I., since there were diverse reports from different tasters on clones, it might be dangerous to have only one man doing the work in one place. He suggested a panel of tasters, the cost being financed from the subsidy.

Dr. Joachim.—I see the point brought forward in the argument by the last speaker and I think Mr. Kane is the best person to answer his question. We do not want, as I pointed out in my paper, to overburden the tea tasters. We shall need to have samples tasted monthly and if these samples number by the hundreds, we will be imposing an undue burden on the tasters. One way out of this situation is to appoint a tea taster to the T.R.I., as at Tocklai. But Mr. Kane's views on this point would be pertinent.

Mr. Kane.—In the first place you do need your own taster, and if he did want the opinion of other tasters on any particular sample, then he could send the samples around; and the tasters in Colombo will be only too happy to co-operate, even if it is an undue burden on them.

Mr. G. Thambipillai.—Is anything known of the life span of V.P. bushes ?

Dr. Visser.—We don't know, but there is no reason to assume that the life span of a V.P. plant is any shorter than that of a plant raised from seed.

Mr. M. J. Green.— I don't think there is very much I can add to what Mr. Kehl has said. He has given a most able talk on what he has seen in three tea growing areas. Unfortunately I have not been long enough in Ceylon to have even seen any tea growing yet ! I hope to put that right in the next week, but all I can say now is something about N.E. India.

In Assam, it would be fair to say that we have now developed some of the biclonal seed to a considerable extent, and in our trial plots some of these progenies are giving up to twice the yield of commercial seed. These plots of course receive the same treatment as the control plots of commercial seed ; the best progenies show far fewer vacancies, possess better quality and are much more uniform than the control.

I think, on the whole, that biclonal seed is perhaps going to be the thing of the future — and not the very distant future. Mr. Kehl mentioned that by 1965 we would have this seed available for general distribution to tea estates. It is rather difficult to predict dates. Already we have got to the stage when we have put out one progeny for district trials, and other progenies have been selected for putting out in district trials as soon as we can establish our own seed baris.

The clonal programme has been, I think, rather disappointing in N.E. India. We have the methods, and have described and demonstrated both the methods and the results to tea estates for many years now, and yet, as you have been told by Mr. Kehl, the total acreage under clonal tea at present in N.E. India including Cachar, Dooars, Darjeeling and the Assam Valley, is only about the same as you have here — about 400 acres.

You are probably well aware of the reasons for this. They include the difficulty of getting a Manager or Superintendent, or garden staff generally, to take up the new methods when they already have seed which they know grows well. Most are not prepared to consider what's going to happen in 10 years' time when they will have this clonal material growing, being plucked and being sold. Even if the necessary keenness is there, difficulty is experienced because of transfer of managers and assistants.

However, we have got to the stage now where some estates have really got quite far advanced, and are talking in terms of planting out 100 acres of clonal tea, immediately. That is a lot of tea, and I think that by the time these estates have got that tea into the field, and others hear about it and see it, then we shall see very great and rapid advances, for nobody likes to be left at the tapes when there is a race for a prize, and the prize is pretty obvious — greater profits — and I do not know of any tea planter who does not want to increase his profits !

I do not think there is anything else I can add, Mr. Chairman.

Mr. S. Pathmanathan.— Is it proposed to import improved good seed from other countries like Tocklai, or even Russia, on an exchange basis ?

Mr. Kehl.— The question of obtaining clones was discussed with our Ambassador in Moscow who maintained that there would be no difficulty in our obtaining frost resistant seed or clones. As regards getting material from India it is a different proposition. Some years ago, when Dr. Tubbs was Plant Physiologist there was an unwritten agreement between the Tocklai Experimental Station and the Tea Research Institute that they concentrate on breeding and we on V.P. But since then there has been a change in Government in India. Unfortunately the present Government does not permit the export of tea seed.

Mr. Pathmanathan.—Not even on an exchange basis ?

Mr. Green.— Already there has been some correspondence in the local Press about Tocklai sending their clones abroad. I think it is most unlikely we are permitted to export seed.

Mr. G. K. Newton.— I wish to know relative to your observation of replanting seedling tea for old seedling tea which at present is giving 1,200 lb. per acre, the age of the seedling tea you propose to pull out, or rather what they are pulling out there, how long that soil has been under crop utilisation, what type of soil it is and what terrain it is.

Mr. Kehl.— The tea uprooted in Assam is generally from 60 to 80 years old. The terrain is quite flat, and as I stated many estates do not do any rehabilitation. A few estates plant *Crotalaria* for about one year, after uprooting the tea. The tea soils are alluvial and are of recent origin. I don't know whether all estates have the same type of soil, but those I visited are of that type.

Mr. Newton.— My point really is, has the soil where this tea is being replanted not been eroded ?

Mr. Kehl.— No, it's all flat land.

Mr. Thambipillai.— With reference to estates giving 1,800 lb. per acre, what is the type of plucking?

Mr. Kehl.— Fine plucking, a bud and two leaves.

Mr. R. J. S. Bean.— What yields do they hope to achieve by uprooting tea already yielding 1,200 lb. per acre, and what is the replanting density?

Mr. Kehl.— They plant more in hedges, $4\frac{1}{2}'$ or $5'$ between rows and $1\frac{1}{2}'$ to $2'$ in rows. I think they anticipate a yield of over 2,000 lbs.

Mr. Bean.— Have they achieved that?

Mr. Kehl.— No, not yet; the fields are still young.

Mr. A. Watt.— Could you tell me whether it is possible to cross clones 2024 & 2025?

Mr. Kehl.— Yes it is possible, but one cannot guarantee the results. Dr. Wight who had the opportunity of examining all our outstanding clones has stated that the crossing of clones 2024 and 2025 might give unsatisfactory results. To be effective, the method of plant breeding must be based on sound genetic principles. The fundamental operation common to all breeding methods is the selection of suitable genotypes.

Mr. R. C. Scott.— How much nitrogen is used on these high-yielding teas?

Mr. Green.— 80 lb. per acre on an average. Some estates obtaining very high yields go up to 160 lb. per acre.

Mr. Scott.— Is there a basis on which nitrogen is applied, e.g. 10 lb. nitrogen per 100 lb. crop?

Mr. Green.— No, there is a limit to the amount of nitrogen which could be applied. After a certain stage the nitrogen would be wasted.

Mr. S. S. Perera.— What are the costs of replanting in Russia and Assam?

Mr. Kehl.— I have no information regarding conditions in Russia, but in Assam it costs about Rs. 750/- to uproot an acre of tea and Rs. 750/- to replant.

Mr. Perera.— What was the cost up to time of yielding?

Mr. Kehl.— I am sorry, I don't know.

Mr. Thambipillai.— Is the absence of disease in Russia due to soil conditions or climatic conditions?

Mr. Kehl.— More to climatic conditions, I should say.

Mr. A. J. D. Gottelier.— In the selected seed bearers is it true that there is an evenness of withering and fermentation which is an important aspect of quality of made tea? Is that a point to be watched in our selection of clones?

Mr. Green.— At the moment there are no clonal tea seed areas to affect manufacture on a large scale. From one or two seed gardens that have sufficient material this does not seem to be a problem. It might be a problem for investigation at a later stage.

MR. J. A. H. TOLHURST'S PAPER

Mr. W. H. W. Coultas.— Would you advise the planting of Guatemala grass in the tea before pulling out the tea?

Mr. Tolhurst.— Pulling the tea out would upset the soil, therefore Guatemala grass must be grown after the pulling out for full benefit.

Some discussion followed a question from Mr. Burroughs regarding consolidation of trenches, the answer to which is summarised in the following passage:—

Mr. Tolhurst.— I'm sorry I couldn't take much part in the last discussion which was going on but I rather think that this question of how long it takes to consolidate the soil, either where the tea has just been pulled out, or else where a trench has been dug and needs filling, that again depends very largely on the soil type, on the amount of organic matter you have in the soil, and naturally on the weather conditions. You can't expect a trench full of soil to consolidate during a 5 months' drought, and if you want to plant tea at the end of the drought period, and you hope the soil has consolidated during that time, you may have a rather nasty shock. We do not now recommend trenching and burying of green Guatemala grass loppings during the actual reconditioning period.

Mr. Perera.— What would you think is the minimum period required to recondition average soil where replanting is likely to be undertaken?

Mr. Tolhurst.— It depends on what you can actually see happening on the spot. The more vigorous the growth of Guatemala grass, or other rehabilitation crop, and the greater the collection of dead litter on the surface, the shorter the period necessary for rehabilitation. If the Guatemala grass is manured well the more vigorously will the roots grow, but you cannot really appreciate the effect of root growth unless you dig down and look at them. By and large I should say that under the most favourable conditions about 1 year should be the minimum period. I'm talking about soils where you've decided rehabilitation is to be done — as to which soils do need rehabilitation and which don't, I could only repeat what

Dr. Visser said and say I don't know. The only way I think we can find that out is — the best way of all — by trial and error. When I said earlier there is scope for experimenting on manuring of clones once they are out in the field, there is also plenty of scope for experimenting with rehabilitation crops and rehabilitation periods.

MR. T. B. PETHIYAGODA'S PAPER

Mr. D. W. G. Burroughs.—With regard to spacing in new clearings, the recommendation appears to be a bit wider than normal?

Mr. Pethiyagoda.—The wider spacing was originally done on the experience we then had based on planting clonal tea on a very good lie of land. The clones grown there, particularly clone 2024, were such enormous spreaders that if any closer spacing had been undertaken it would not have permitted subsequent operations of cultivation. The closer spacing is suggested on poorer and steeper land that is exposed to wind.

Mr. Watt.— Could you give an indication of the difficulties you have had of forking under dense cover?

Mr. Pethiyagoda.—Forking under a dense cover is difficult, but with a certain amount of judicious pruning that difficulty can be overcome.

Mr. Coultas.— Could you say which gives a higher yield, more plants to an acre with a smaller spread or fewer plants with a better spread?

Mr. Pethiyagoda.— It is my personal opinion that a large number of bushes per acre will give a higher yield in the case of seedling tea. I do not know whether this will be so in the case of clonal planting. I will quote an example: at St. Coombs, in No. 14A field we have about 4,200 bushes to the acre, and 14B field nearly 5,000 bushes to the acre. Both fields were planted about the same time with seed obtained from the same source. The yield of field No. 14B is usually much higher than the yield of field No. 14A, where the density of bushes is less.

Mr. Thambipillai.— (1) Why was field No. 1 unsuccessful? Can you recommend replanting under such conditions? (2) Do you recommend the use of Sterameal for young tea? (3) What is the cost of bringing it into bearing?

Mr. Pethiyagoda.— Answering your third question first. Costs of No. 1 Clearings at St. Coombs cannot be used for comparable purposes because replanting this area was undertaken as an experiment. Regarding your question about Sterameal I shall leave the answer to Mr. Tolhurst. Answering your first question, in the No. 1 Clearings we were dealing with the minimum requirements for replanting. The fertility of the soil was very low and it had been subjected to erosion while it was under tea for over sixty years. The area is also badly wind-swept. If the conditions of soil, etc. are above the minimum requirements then replanting could be undertaken economically. But the fact must be accepted that there are areas in Ceylon presently under tea which will be definitely uneconomical to replant successfully.

Mr. Tolhurst.— I prefer Sterameal or a similar balanced organic manure to inorganic manure for young plants. I should not have said "Sterameal," because there are also other balanced organic manures in the market, and they all cost about 50 per cent more than similar inorganic manure. But if there is a good quality of organic matter available in or on the soil I rather doubt whether one of these organic manures is worth the extra cost. They are safer I think than inorganic manure;

particularly if they become mixed among the roots of a young plant there is far less risk of damage. Always remembering that these balanced animal meals contain added inorganic potash, which can cause damage if used in too large quantities or if applied too closely to the plant. If there is not much organic matter in the soil at the time of planting then you probably would get a benefit from the organic manure.

Mr. Perera.—What was the cost of rehabilitation on St. Coombs ?

Mr. Pethiyagoda.—We have spent something like Rs. 190,000/- on the rehabilitation and replanting of approximately 21 acres. This sum includes capital expenditure incurred on machinery such as a power winch and nursery equipment. However, as I said earlier these figures do not bear any relevance to costs in practice because the work was done on an experimental basis.

Mr. N. M. Sanders.—Can you give some idea of the average organic matter content of No. 1 field ? How does it compare with the surrounding fields ? Has Mr. Tolhurst got any figures ?

Mr. Tolhurst.—There is a lot of difference I imagine. Over in the west end of the estate the total organic matter content of the soil in many cases is about three times as much as the organic matter in the soil in No. 1 clearing. When tea was growing in No. 1 the organic matter was higher than now, I am quite sure. The reason being that some of those areas were exposed for quite a considerable period and that meant that the most valuable organic matter, the most active and readily available, obviously decomposed first.

Much of the organic matter remaining in the soil after the upheaval of uprooting old tea is of a type which is not going to be of much use to a young plant; that is why I am so much in favour of rehabilitating with a crop, except in some very exceptional circumstances. For in that way you do provide not so much a large amount of organic matter, as a fairly large amount of very rich organic matter which will decompose steadily, supplying the young plant with a balanced nutrient mixture.

Dr. Visser.—In connection with replanting attention should be paid to the use of cover crops in the young tea, sown some time before or after the plants are put out. Thatching the tea immediately after reconditioning and preparing the land for replanting is good advice. However, the advantage of a cover crop growing 3—5 feet high is that it gives the necessary protection against wind and overheating.

Naturally, with a cover crop the question of competition for food and water arises, but it is likely that this drawback can be overcome by ample manuring and lopping in most instances. The kind of cover crops I have in mind are e.g. *Tephrosia*, *Sesbania* and *Crotalaria*. In eelworm suspected areas the latter is preferable, as many *Crotalaria* species have been found to be resistant against eelworms, while the former are to some extent susceptible. Small scale experiments with Marigolds (*Tagetes erecta* and *patula*) have indicated that this flower may also be a promising cover crop in young tea, particularly so as it has been found to have a marked adverse effect on the parasitic eelworm population.

MR. G. K. NEWTON'S PAPER

Mr. Mahadeva.—Although I did not intend to speak this morning I feel it is my duty to make a few comments on the questions which Mr. Newton has raised.

The first point which Mr. Newton mentioned in his paper was that the proposed subsidy of Rs. 2,500 per acre would not provide a sufficient inducement for estates,

or at least for the vast majority of estates, to undertake regular replanting programmes. My answer to that is that this figure of Rs. 2,500 per acre was suggested to the Government in a joint memorandum by the Planters' Association and the Low-Country Products Association.

The next point which Mr. Newton made in his paper was that Government was going to make a profit out of this Scheme. He built his case on one hypothesis, namely, that each and every estate over 100 acres in extent was to be allowed to replant exactly 6 per cent of its total acreage over the next 6 years. On the basis of this hypothesis he worked out figures to show that an estate with a yield of 500 lb. per acre would receive in replanting subsidies more than it contributed to the Replanting Fund, while an estate with a yield of 700 lb. or 900 lb. per acre would pay very much more into the Fund than it receives back in the form of replanting grants.

My answer to this is quite simple. The basic hypothesis on which he based his whole argument, namely, that each estate would receive 6 per cent of its total acreage, is incorrect. There will be no fixed and rigid rule that each estate will receive exactly 6 per cent of its acreage over 6 years or 1 per cent of its acreage each year under the Replanting Scheme. It may happen that some estates are prepared to replant more than 6 per cent of their total acreage in the 6 year period while others are not prepared to undertake any replanting at all in which case those who are ready and willing to replant will clearly be given much larger acreages than would be available to them under the rigid application of the 6 per cent rule.

The position can quite simply be stated as follows: A certain amount of money is being collected from the tea industry by the levy of a replanting cess and this money is being funded separately in a special Statutory Fund. No part of this money is put into Government coffers. The law of the land lays down that every cent paid into this Statutory Fund, the Tea Subsidy Fund, will be used for the purposes of the Tea Rehabilitation Scheme. Every cent of money taken in the form of cess will be returned to the industry in the form of subsidies. The only exception would be the money used to meet the cost of administration.

It has been my endeavour in running the Rubber Replanting Scheme to see that the cost of administration — the overhead expenses — which are incurred mainly in the payment of inspection fees to Visiting Agents, are kept to the absolute minimum. I hope that in the Tea Replanting Scheme too the total overhead expenditure will be small — probably about 3 per cent or 4 per cent of the total cost of the Scheme. The rest of the money, every cent of the money, will be paid back to the industry in the form of subsidies. If you analyse the figures for individual estates, as Mr. Newton did, it may happen that some estates will receive more in the form of subsidies than they pay into the Fund while others will pay more than they take back. But, if you take the industry as a whole, all the money collected will be refunded to the industry and the Government would make no profit from the operation of the Scheme.

Mr. Newton: I wish to comment on Mr. Mahadeva's answer.

He mentioned that the figure of Rs. 2,500 per acre as the rate of subsidy was suggested by us. This is quite correct, but we asked Rs. 2,500 per acre on the assumption that the Government would give us the money by way of a rebate from the export duty and not by the imposition of an additional cess. The other comments made by Mr. Mahadeva are I think extremely encouraging, so encouraging indeed that before long he should announce certain amendments to his proposal whereby we can expect a little more than it is proposed to give us.

Mr. Mahadeva.— The export duty on tea — I am referring to the export duty and not the cess — was, I believe, higher than the present rate of export duty at the time when the proposal for a subsidy of Rs. 2,500 per acre was made by the Planters' Association. I think practically everybody agrees that the tea industry, or at least a certain section of the industry, is over-taxed today — particularly the section of the industry which produces mid-low and mid-country tea. Some of you may be aware that the Government is at the moment giving serious consideration to the question of taxation on tea. It has already taken steps to give relief to the producers of lower-priced teas in the form of rebates of export duty on teas which fetch below a certain price.

The iniquity of the present export duty on teas is that teas which fetch prices of Rs. 4/ to Rs. 5/- a lb. pay the same rate of duty as teas which fetch prices of Rs. 1/- a lb. Various proposals for the levying of a more equitable scheme of duties on tea are now under consideration and I think that within the next two months a more equitable form of taxation for the tea industry will be announced by the Government. This question of export duty is however a distinct question which should be treated separately from the replanting scheme and I do not think we should tie the two together.

Mr. Pathmanathan.— At the Conference in 1955 when Mr. Newton brought this question of replanting, we requested the then Minister of Agriculture that subsidy payments may be made from the existing duty at that time. It is very rarely that I disagree with Mr. Newton, but on this occasion I regret I have to. We have to look at replanting from a broad outlook. After all the soil is a national asset and we tea growers have got the best out of it for about 80 years and what is 80 million expenditure in the life of a nation when we are putting it back to build up the soil.

There is no doubt at the moment we are being heavily taxed and I know that many of the mid and low-country estates will not be able to participate in this scheme unless further grants or loans are granted on a long term basis. It may be possible for low and mid-country estates to approach Government for long term loans to finance the difference in cost. We could then replant these areas from which we have had the best for several years. I do hope that as in the case of rubber we replant, or we perish. It was only the other day that the Minister of the Union of India promised that the Government would do its utmost to assist the tea growers in India by giving as much relief as possible by lower duties and assistance with grants, if necessary. I therefore feel that economics alone should not influence a decision on replanting, but we have to look at it as a national asset. The wealth of Ceylon is its soil!

PAPERS BY MESSRS. M. J. GREEN & W. J. GRICE

Mr. D. W. G. Burroughs.— What is the average elevation in your country ?

Mr. Grice.— Our average elevation would be between 4,000' and 4,500'.

Mr. R. C. Scott.— What is the average yield in Darjeeling ?

Mr. Grice.— About 320 lb. to the acre.

Mr. Ratnayake.— Why is your Government opposed to the export of tea seed ?

Mr. Green.— I don't know why, but I suppose they are doing the correct thing.

REPORT BY THE UVA REPRESENTATIVE

Gorton Coombe

(Poonagalla Group, Bandarawela)

The Uva delegation agree that much old uneconomic tea requires replanting, especially that land previously under coffee and planted in tea at the turn of the century, after coffee had been decimated by disease. The planting in tea being carried out to the best of the then proprietors' limited finances and knowledge of tea as a crop. But we are very strongly of the opinion that it might well be an unwise and expensive risk for estates and Government alike, if estates embarked on large replanting or new planting programmes until the T.R.I. have a full and experienced research and advisory staff at St. Coombs, and Government have recruited a competent staff to assist the Tea Controller to administer the Tea Subsidy Act No. 12 of 1958.

The T.R.I., with its seriously depleted senior scientific staff, cannot undertake any estate visiting or advisory service on replanting and all its subsidiary problems, with special reference to soil analyses for disease especially eelworm infection; and fertility and the production of suitable and fully acclimatized clonal plants.

The Tea Controller will require an expert team to advise him and visit estates to report on the progress of work in its various stages under the Act. In the latter case, there may be a few experienced planters able to assist, but it is very doubtful, if there are sufficient for the probable large volume of work. In both cases, to find and give specialised training to suitable executive officers must take at least 3 or 4 years before their advice can be of any value to Government or the tea industry.

The vegetative propagation of clonal planting material has made some advance on many progressive estates, but much research work still requires to be done before clones can be confidently recommended and used for a particular district or estate. Our present practical knowledge on the vegetative propagation of clonal cuttings is still elementary.

Approved Clones

Extensive use of the expression "approved clones" is made in connection with the Tea Replanting Scheme, but as far as is known, no precise definition of the term has yet been made. Is it intended that estates should be allowed to "approve" their own clones, or will approval be accorded only by officers of the T.R.I. or Government Officials nominated for this purpose; and in either case what minimum standards are required, and what process of testing, if any, is envisaged?

So, in Uva, we feel that to launch a replanting scheme is commendable, but it is premature at this stage for any estate to embark, except in an experimental manner. This may sound unduly cautious, but our objective must be to guarantee the greatest success without any risk of costly failures. Many estates have started replanting with V.P. and are said to be showing fine results from their enterprise, but Uva still feels that, for as vast a Scheme as that which is now envisaged, a most prudent and logical approach is imperative.

Transfer of Acreages

It is suggested, for consideration, that in certain cases, it would be in the general interest of the project, if acreages for replanting could be transferred within an Agency or group of estates. For instance, a low elevation Estate might have uneconomic tea in land, which, despite even prolonged attempts at rehabilitation, would never be a satisfactory proposition. In such circumstances, it might well be that higher elevation estate in the same Agency or group of estates could plant in patna, or other available land, the acreage uprooted on the low elevation sister estate.

In the same context, the Uva delegation feel that too much stress cannot be laid on the necessity for detailed analysis and expert examination of all soils earmarked for replanting.

The Act stipulates the uprooting of tea before replanting can be undertaken in an alternative area.

In steep and precipitous places uprooting tea and the subsequent abandonment of the area would be likely to cause erosion on a massive scale, and in such cases, it would be preferable to merely abandon the tea.

We support the desirability of estates starting trial areas, with the special object of research into the practical field problems that will arise on each estate, with special reference to cost of preliminary, planting and upkeep works; the selection of clones; laying down of acclimatized multiplication plots and nurseries. Such estates could provide much advanced and valuable information, which could be obtained in no other way.

The first problem is the selection of areas to be replanted and the factors that should be taken into account in making that selection. We advise that it would be preferable to select suitable undeveloped patna and jungle land to replace acreage to be replanted. If such reserve land is not conveniently accessible, then the existing tea area should be replanted. Whether the land be new or old to tea, a minimum period of soil reconditioning is essential, especially in the case of new patna land, which has, generally, in Uva, been chena-ed regularly, closely grazed by scrub cattle and annually burnt during the summer drought, so that the surface soil is of doubtful fertility.

The actual area to be selected is a purely economic problem for each estate to decide, and is governed by the primary desirability to fill the factory in the most economic manner, with leaf that will give us the quality and flavour we require. The best tea will respond to cultivation, but the medium poor jat at the highest elevations, which has passed its best, can only achieve increased productivity by replanting. Uneconomic low elevation areas can then be taken out of production, unless Factory extensions are contemplated.

We agree that a minimum fallow period between uprooting or clearing and replanting should be 2 years under cultivated Mana and Guatemala grasses. But some hold the view that this fallow period can be reduced, if very well grown vigorous basket plants are used. By "well grown" we mean "Plants not less than 15 inches high," which may even have been centred and show some frame development before removal from the nursery.

On the question of preliminary works before planting, 18 inch deep \times 12 inch holes are preferred to trenches, as, under no circumstances, should half-rotted vegetable matter be allowed in the soil around the new plants.

It is considered preferable to use more than one clone in a clearing, but that each clone should be planted in separate blocks, owing to their different framing and growing characteristics.

Contour lines are naturally preferred, with 4 to 5 feet between lines and 2 to 2½ feet between plants. This will permit of the vigorous frame developments of most clones and produce a dense cover of tea, without undue overcrowding — actual distances depending on clones used.

On clone types, as already stated, our knowledge is elementary and, until the T.R.I. can advise, every estate must experiment on their own, bearing in mind the urgency to have the selected clonal multiplication plots well established well acclimatized and in full production as soon as possible.

We agree that the manuring of basket nurseries and growing plants should be liberal and applications as frequent as possible, though omitting drought months for plants in the field. We prefer Sterameal for nurseries and up to one year in the field, and thereafter T 180. Nurseries require minimum monthly manuring @ 1 oz. per 24 plants. Field plants, a minimum of $\frac{1}{2}$ oz. per application per plant and a minimum of 3 oz. per year.

On the subsequent treatment of plants, there is divergence of opinion, but the Uva delegation agree that careful bending and pegging of immature growth accelerates frame development and shortens the period before the bush can be considered mature.

For over-all costs, excluding buildings, for the period out of bearing, Rs. 5,000/- per acre is a minimum for a really successful clearing. This will allow for the preliminary year, 2 years' fallow and 2 years' upkeep. This Rs. 5,000/- per acre is for field works only and excludes supervision, buildings and any possible factory extensions.

REPORT BY THE ŠABARAGAMUWA REPRESENTATIVE

J. W. Craig
(Pelmadulla Group, Kahawatte)

Assuming that old tea which is selected for replanting will be about 40 years or over and the land in continuous cultivation over this period it is considered that the soil must be adequately reconditioned prior to replanting. The soil carrying the old tea will have suffered from erosion, loss in drainage, exposure, leaching and weed growth, poor tea usually being associated with poor soil condition. Actual requirements and duration of reconditioning will be best ascertained from observations of the carbon nitrogen ratio.

The pH value of the soil to be reconditioned should also be determined. Over-acidity results in sour soils and infertility and can be counteracted by dressings of lime. As these soils will have received repeated applications of sulphate of ammonia it is considered unlikely that suitable soils for replanting will possess too high a pH value.

As regards reconditioning and the building up of humus entailed, the best provider is of course cattle manure or dung which is unlikely to be available in sufficient quantity on estates. It will therefore be necessary to obtain humus from the decomposition of plant residue. The requirements for this purpose will be a plentiful supply of carbohydrates from frequent loppings, a penetrative root system and a complete soil cover. At present Guatemala grass is considered the most suitable provider of these three requirements.

Leguminous plants fall into three categories, namely creepers, shrubs and trees. For various reasons creepers and trees do not fulfil these requirements. Shrubs generally lack sufficiently penetrative root systems but if this requirement could be met there would be the additional advantage of the fixation of atmospheric nitrogen. It is for this reason that the retention of the existing stand of leguminous shade and green manure trees during the period of soil reconditioning should be considered beneficial.

As far as uprooting of the old tea is concerned a light portable winch has been found most economical for uprooting in the Sabaragamuwa District so far. It is possible with the deeper root systems found at higher elevations that a heavier winch will be required but these are also available.

Following uprooting, grubbing of broken roots, levelling of soil, draining and contour-terracing are attended to as necessary. New rows are traced and the crop selected for reconditioning planted along the future cultivation rows. Weeding, lopping and manuring with artificials is done for the duration of the period of reconditioning.

Immediately prior to replanting the reconditioning crop is removed and if it has been left, the old stand of leguminous shade and green manure trees uprooted and cleared. Holing and filling is now possible in readiness for replanting. The new stand of shade is planted along with the tea. In the drier areas thatching should prove most beneficial.

The importance of first class clonal material for replanting is already most evident. It is therefore necessary to try out various clones in advance to determine

those best suited for the particular replanting as the success of a particular clone has been found to vary according to differing conditions. It must be clearly emphasised that tea cannot therefore be replanted to the best advantage overnight.

Preliminary trials will have to be carried out to ascertain best suited clonal material, a multiplication nursery will require to be planted up to supply the selected planting material apart from the period of soil reconditioning. It will therefore be necessary to plan a minimum of four years ahead of any actual replanting.

At this juncture the advisability of replanting separately with several of the best clones is suggested. Both yield and quality have to be considered apart from which there is liable to be the future unknown temperament of a particular clone to both drought and disease. The timely laying-down and planting of nurseries with adequate material will of course be essential to the success of any replanting.

It is not intended to go into the bringing into bearing as this is bound to vary according to not only different conditions but individual preferences nor is any effort made to refer to costs which will vary depending upon size and stand of old tea to be uprooted, spacing of new stand, cost of plants, etc. The period of reconditioning will also have an effect on the financial side of the undertaking, but it is emphasised that the ultimate success of the replanting will depend on the condition of the soil, other factors being equal.

If replanting is undertaken on a large scale it is considered that a readily available scientific advisory service is absolutely essential. The shortage of staff at the T.R.I. is too well known to need comment. Even with a full complement at the T.R.I. it would be very desirable to have Agricultural Officers attached to each major district to pay routine visits and for consultation and assistance in conducting trials and experiments. The cost is too high and the hazards too many to expect the individual planter to shoulder all the responsibility without specialised assistance. Soil sampling alone is a vital need and with the diversity of conditions in the different districts so great it is surprising that District Scientific Officers have never been appointed.

It is therefore considered essential that a service should be provided without delay for soil analysis to determine the carbon nitrogen ratio and pH value. The success of a costly undertaking of this nature must necessarily depend upon the interest stimulated and it is felt that every assistance and encouragement must be afforded if the enthusiasm it deserves is to be forthcoming.

Finally it is felt that especially considering the heavy outlay of expenditure involved, unsuitable or even marginal land should not be considered for replanting in tea. In this connection it is also pointed out that in the low-country there are many tea cum rubber estates where some areas of old tea would be more suitable for replanting in rubber and in some cases old rubber better suited for replanting in tea. Where this is considered to be so it is hoped that financial assistance will be afforded to ensure that the land is replanted in that crop for which it is best suited, if necessary on an equivalent acreage basis. Results already obtained indicate that no soil reconditioning is required when old rubber land is replanted in tea.

As regards the subsidy scheme, it is considered that Rs. 2,500/- per acre will fall very considerably short of the actual cost which might be placed in the region of Rs. 4,000/- to Rs. 4,500/- per acre. It is interesting to note that for example in the case of a 1,000 acre estate yielding 1,000 lbs. per acre per annum that while it would be paying Rs. 40,000/- per annum in cess towards the scheme, if the limit of 1 per cent. of the acreage per annum is replanted it will only recover Rs. 25,000/-. It therefore follows that inclusive of the cess in the example taken the estate would be spending Rs. 40,000/- plus a further Rs. 15,000/- to Rs. 20,000/- to cover the actual cost of replanting 10 acres or the equivalent of Rs. 5,500/- to Rs. 6,000/- per acre.

REPORT BY THE KELANI VALLEY REPRESENTATIVE

R. J. S. Bean

(Formerly Manager, Ederapolla Group, Bulathkohupitiya)

It is difficult in the short space of ten minutes to give anything but the barest outline of an assessment of the progress that has been made in regard to V.P. development over the past 10 years in the Kelani Valley and Ceylon generally.

So far as I am aware large scale replanting in clonal material has been virtually limited to low-country districts. This has been so since reserve land, jungle and old rubber land have been more readily available in that territory. With the present availability however of the Tea Replanting Subsidy Scheme which will make it both possible and desirable for up-country estates to rehabilitate and replant their lower yielding areas, V.P. development and research are again spotlighted as indications are that such replanting will be restricted exclusively to vegetatively propagated material.

The Replanting Subsidy Scheme is a direct and additional charge on the industry of 4 cts. per lb. or Rs. 16,000,000 annually and the only chance of the industry regaining any portion of that not inconsiderable sum is by replanting and replanting in V.P. Now to replant in clonal material the following are pre-requisites:

1. A nursery.
2. A clonal multiplication plot of at least one acre in extent.
3. Proved clonal material, either ex-estate or from T.R.I. or other approved sources.
4. Replanting experience, and a knowledge of the idiosyncrasies of V.P. and its reaction to elevations, climate and particular soil conditions and environment.

The first three essentials are readily obtainable. In my opinion the latter is in short supply, and I have seen some very disappointing V.P. clearings brought about by sheer inexperience which can only be adjusted by trial and error, and the application of principles of sound common sense to agriculture.

It has been established to the satisfaction of the T.R.I. and is generally accepted that in trials in the low-country over substantial acreages V.P. is capable of yields in excess of 2,500 lbs. per acre from a stand of 5,000 bushes. Good seedling tea of equivalent vintage and density can also produce yields of 1,500 lbs. or more. The need for replanting to reduce costs is therefore evident and the advantage of clonal material over seedling is in direct proportion to those yields. The following facts and data have, in my opinion, also been established over the past ten years:—

There is no significant difference between the intobearing costs of V.P. as against seedling. The additional nursery costs (estimated at Rs. 400/- per acre) are recovered by the saving of 1 year's maintenance in the field—*i.e.*, 2 years against 3 into production in the low-country, 3 against 4 up-country.

Provided planting out is done in monsoon conditions there should be no need to utilise expensive basket plants or mechanical transplanter for planting V.P. in the field.

In the low-country no V.P. plant should be put out under 12 months and the filling of trenches or holes and planting out should be done concurrently.

V.P. is initially more susceptible to drought conditions and requires heavy shading and initial protection. The establishment of light shade and cover is desirable in the year prior to planting.

Subsequent to establishment V.P. is definitely more resistant to drought than seedling tea in equivalent conditions presumably because of the diversity of its root system.

The two main criteria for clonal selection should be (1) yield and (2) quality (including manufacture). There are classes made as to the resistance of clones to shot-hole borer *Poria*, Blister blight eelworm, etc., but if a vigorous quality clone is utilised there is considerable natural resistance to most of the ills to which the tea bush is subject.

Manufactured clonal tea either mono-clonal or poly-clonal is in no way inferior to seedling tea. In fact, where selection has been exercised with good judgment, trials have indicated a marked superiority of clonal V.P. tea over normal estate teas in the cup.

There has been some stubborn resistance to V.P. in some districts particularly those subject to severe droughts but I am personally confident that if:

1. planting out is done in monsoon conditions;
2. filling and planting is concurrently done;
3. mature material is used;
4. adequate initial shade and protection is given

there should be no real difficulty in the establishment of successful and high yielding V.P. tea/in any tea growing district in the Island.

In the short time at my disposal I have only been able to recapitulate and categorize the results of my personal experience with V.P. development over the past ten years.

I would however apologise for appearing somewhat dogmatic in my enforced brevity but take comfort in the fact that by and large the conclusions reached above have in the main been generally substantiated by the experience of the T.R.I. in both up and low-country districts.

We still have a long distance to travel and much to learn in V.P. development and research, but I think the industry can take heart and encouragement at the progress made, and results achieved by the T.R.I. in replanting technique generally and we should congratulate Dr. Joachim and his able staff on their progress to-date and in particular on the initiative shown in the organisation of this most interesting and stimulating symposium.

REPORT BY THE SOUTHERN PROVINCE REPRESENTATIVE

H. B. Goonewardene
(Sirimewana Group, Yakkalamulla)

The introduction of vegetative propagation has been one of the foremost achievements in the tea industry in our time.

This form of cultivation, though well tried out and proved successful in other districts, is still in its infancy in the Southern Division. This is by no means due to lack of interest or enterprise, but mostly to the failure of the original vegetative propagation work done with estate clonal material not reaching the expected high standards. In other cases failure was due to the bad handling of cuttings, freely distributed by the Tea Research Institute, resulting in unsatisfactory results in nursery beds.

There are a few estates that have successfully planted out V.P. plants from their own material which are in plucking for the last three to five years. But the results obtained, the growth of the bushes having shown up adversely when compared to the T.R.I. clones, has diminished the interest of those who bravely tried out their own clones. Few plucking points, high percentage of banjies and erratic growth are some of the reasons given for discarding these local clones.

Out of the T.R.I. clonal material tried out in the district T.R.I. 2023 and T.R.I. 2026 are by far the most successful. Their fast rooting qualities, rapid shoot growth in the nursery stage, good spread, and survival in drought are some of the characteristics noted to-date. T.R.I. clones 2022, 2024, 2025 and 25 too have been fairly successful, but are not up to the standard of the former clones. In these latter clones the second generation seems to do better, perhaps due to acclimatisation, though their growth is comparatively slow to start with.

Production of Clonal Material.

Vegetative propagation of tea was started at Sirimewana Group, Letchmi Division, as late as July 1955. Nine rooted plants of each clone were planted out in multiplication beds at a distance of 6 ft; within a short space of 18 months the 2023 and 2026 plants were touching each other. After pruning down to 20 inches an initial harvest of 4000 cuttings was obtained. However, prior to removal of cuttings and light plucking (a bud and leaf) was given to these bushes ten days earlier. From then onwards a regular crop of 8,000—12,000 cuttings has been obtained every four months depending on the weather.

Manuring is done every three months — an initial dose of one ounce per bush now gradually increased to four ounces per bush. Green manure thatching is regularly done. All mother bushes including a few non-T.R.I. clones, such as Craighead 13, Talankanda 43 and 51, etc., are given the same treatment. The results with some of the more commercialised clones other than those mentioned are comparatively disappointing in the district as a whole.

Nursery Operations.

The selection of a suitable site for nursery plots is an all important factor. After several expensive trials, it has been conclusively proved from the percentage of success obtained that a mixture of porous soil with a good gravelly bottom is the ideal. The gravelly bottom provides adequate drainage. Soil rich in organic content, or soil to which manure has been added was noted to make the cuttings remain turgid with hardly any rooting or much delay in rooting, if any. The beds were rested, weeded and watered before use. Sites with the slightest suspicion of water-logging were avoided. The planting of cuttings was done as close to one another as possible in beds three feet wide. Dense shade tended to reduce photosynthesis causing the fall of the mother leaf. After adopting several methods of shading the most suitable form was found to be the erection of a bracken pandal 18 inches high. The sides too were covered with a fairly thick stand of bracken.

To start with, watering was done twice a day for the first fortnight. This was gradually decreased to once in two to three days or even less, except in periods of acute drought. Damping of the beds due to over-watering has been one of the major of failure of cuttings to root in the nursery beds. Perhaps the poor results obtained by many with vegetative propagation has been due to over-watering. Keeping the bracken cage well moist is sufficient. The best method of watering is by use of a knapsack sprayer.

Adopting the methods mentioned, 75 to 80% success has been regularly obtained at the end of four months from putting out cuttings. If the weather is unsuitable, plants are kept six to seven months in the nursery. Within four to five months the plants have reached the height of the bracken pandal. In case of delayed planting, the rooted cuttings are centred to four leaves prior to removal from the beds.

Removal of plants from the beds was originally done with the Hersall Transplanter. This method had a few disadvantages. For instance, cuttings had to be put out rather far apart to enable the use of the transplanter to remove rooted cuttings separately. Much labour was expended in the transport of rooted plants to distances, besides the labour actually required to operate the instrument itself. Also, a bed could not be used more than once without building up the soil for the next set of cuttings. Therefore the simple method of using a hand trowel was adopted to remove the plants from the nursery beds. This enables several plants with some earth clinging to the roots to be removed in discarded rubber coagulating pans and transported at a low cost.

Planting in the Field.

All V.P. plantings were done in clearings originally cultivated in seedling rubber. Prior to new clearing in tea the soil was reconditioned by the extensive planting of Guatemala grass. The grass was planted as close as a foot apart, and allowed to grow for a minimum period of 18 months. When well established the grass was manured with the Guatemala manure at the rate of 4 cwt. per acre. The grass was regularly lopped every three to four months ten inches from ground level and the loppings used to thatch the ground.

After 18 months the Guatemala was cut at ground level. To accelerate the decomposition of the loppings a small quantity of sulphate of ammonia was broadcast over them. Any Guatemala shoots that sprung up again were pulled out. Shade trees, both high and low were then established. The low shade was planted rather thickly with the idea of gradually eliminating it once the clonal plants grew up sufficiently.

The tea was planted at a distance of 2 ft. by 4 ft. Though V.P. plants seemed to withstand drought better than seedling plants of the same age, it was essential to maintain a heavy stand of low shade for the first year at least. After the initial dose of Sterameal three months after planting, T₁75 manure was given to all fields approximately 2 oz. per bush every three months. This has given very encouraging results.

Rehabilitation & Replanting.

The benefits of replanting with clonal material may be lost if the soil fertility has deteriorated due to previous cultivation or neglect. In such instances the temporary establishment of Guatemala grass is absolutely essential. The mulching prevents the soil from being sun-scorched, and the grass effects a reduction in the build-up of pests and diseases. There are a number of other advantages of Guatemala which need no mention here. Being a greedy feeder the grass must, however, be well manured. Broadcasting the Guatemala manure is sufficient.

A period of at least three months should be allowed to lapse after eradicating the Guatemala before planting the tea.

Some Observations of V.P. Work on Other Estates.

The progress of V.P. work in most other estates in this district is about the same. All have had very good success with clones T.R.I. 2023 and 2026. But in Enselwatte in Morawak Korale, clone T.R.I. 2024 has done by far the best surpassing 2023 and 2026. It is very unfortunate that clone T.R.I. 2026 is so heavily susceptible to Blister blight in that area that further new clearing work with this clone may be considered unsuitable. All other T.R.I. clones are doing very well at this elevation of 2,000-3,000 ft. though growth is rather slower to begin with.

At Walpita Estate, Poddala, certain modifications in respect to shade, etc., have been done. Guatemala pandals have been successfully adopted as a roof for nurseries. No centring has been done, but regular bending has been carried out more than once to accelerate the spread as early as possible.

At Wicklow Hills too the same clones mentioned earlier have shown the best results as at Walpita. A large number of local clones have been tried out in the field, one acre per clone and the choice reduced to three after much elimination. Some of these estate-clones show remarkable growth, due no doubt to the attention paid, but crops have not been encouraging to continue further cultivation.

Cost of Opening up V.P. Planting Material.

The cost of planting tea with clonal material is not so prohibitive as one would expect, the initial outlay on nursery work being the most expensive item. Done on a large scale a rooted plant about four months old should cost -/15 cts.

Rehabilitation of the soil before planting is not so expensive, but a matter of time mostly. Old seedling rubber land rehabilitated and replanted cost us about Rs. 1,500/- an acre, excluding the expenditure on stone work for building leader drains, etc.

I must thank Mr. Armstrong of Walpita Estate, Poddala, Mr. Oliver of Wicklow Hills, Wanduramba, and Mr. Y. M. Fernando of Enselwatte Estate, Deniyaya, for giving me all the help in showing me round the V.P. work done on their respective estates.

REPORT BY THE KANDY DISTRICT REPRESENTATIVE

Gordon Pyper

(Hantane Estate, Kandy)

Little actual replanting on any scale larger than 1 acre in extent has been done on estates in the Kandy, Matale, and Madulkelle districts though new planting of old rubber with seed-at-stake or nursery plants has been extensive.

Most estates have been doing V.P. work for some years past and have developed their nurseries and established multiplication plots. The early difficulties in raising plants from cuttings have now largely been overcome with better nursery techniques, and failures are not so much in the nursery but after planting in the field.

It is not easy by any means to grow V.P. cuttings in nurseries, but it is more difficult to prevent the cuttings from dying for little or no apparent reason after planting out. They need very careful aftercare and nursing. It is this particular trait of V.Ps to die off in the early planting stages which makes the majority of superintendents feel somewhat disinclined to go on with large scale replanting or new planting solely with V.P. material.

The weather in our district is to blame for this. Over the last ten years rainfall has become badly distributed and the weather generally increasingly erratic. Short, sharp, severe droughts may now be expected in any month of the year irrespective of the seasons. In this variable weather our gravelly soils tend to rapidly dry out and over-heat and V.P. plants especially seem to be extremely sensitive to dry spells after planting in their early stages of growth, whereas, seed-at-stake or seedling plants grow without discomfort and are far less affected. The former seems to need even rainfall over a fairly long period to get established.

The critical period for V.P. plants whether they be in baskets or not is from 6—8 weeks after planting. Though planting out in baskets is more generally done, this does not seem to stop them curling up their toes and drying off at these sudden changes of weather. Heavy thatching with mana grass, etc., does help to prevent such deaths.

Some would say they need more aftercare but most agree that it is inherent in the plant itself, the root system being near the surface while seed plant roots go straight down. Casualties are high in the order of 25 per cent. or more within a space of a few weeks in some cases. Large reserves of plants are therefore most necessary before planting can start on any scale.

Actually with V.P. material presently available replanting can only be done by the large estates and that only of perhaps 1—5 acres depending on the number of plants available on each individual estate, the smaller proprietary estate of 100—200 acres will not be able to do anything at all nor are they in a position to afford large V.P. nurseries. They are very expensive items.

The conclusion therefore is that before any large scale replanting scheme can start it must first be necessary:

1. To establish a large central nursery run by the T.R.I. to test and produce large amounts of cuttings and plants. Also to give technical advice.
2. To conduct further research into factors which seem to affect young V.P. plants taking into consideration our variable climate and soil, in order to establish a technique of planting which will ensure the best results and reduce the present high casualty rate which at the moment makes replanting on a large scale risky. This is felt by all to be most essential.

This would not therefore seem to be the right time to put the subsidy scheme into operation if purely V.P. material is to be used, and I think I can speak for everyone in the district that a start should first be made to set up a large scale production of clonal material in a proving nursery followed by planting trials before anything else; otherwise the whole thing will just be a complete waste of money.

If, however, the Tea Controller intends to push the scheme through straight away, then it would be better that the smaller estates of 100—300 acres be allowed at least 50% or more of the acreage for yearly replanting using well recommended seed from recognised estate seed bearers, either seed-at-stake or nursery plants. Only then will the scheme be considered to have any chance of success.

Yields of 1,800 lbs. per acre or more are being obtained from new clearings planted with seed, why not then use it and be sure of success than very limited V.P. clonal clearings which at the best might only give meagre results? "

Nothing in the scheme gives any clear details of rehabilitation of old tea soil. In our area there are estates of 100 acres or more which have resulted from fragmentation of larger estates and there are others which by bad management are in a deplorable state in which no replanting scheme would have any chance of success unless the soil was rejuvenated. From the state they are presently in, 5 years under Guatemala grass, etc., would not seem enough. On better run and Company estates 2 years would be sufficient as the soil has kept its tilth and fertility.

It seems very doubtful if exhausted eroded land should be allowed to come into the scope of the subsidy. Who is going to decide on whether the land is in the first instance suitable for replanting? How long is rehabilitation going to be allowed? Without it the scheme faces certain failure and money will have been thrown away to unscrupulous owners.

Who is going to do all the inspection and follow up to ensure that (a) V.P. material is available, (b) the land is fit for planting or for continued rejuvenation? V.P. material as I have said is tricky enough in good soils of the average well run estate, how will they survive at all in old eroded and exhausted soil of neglected estates?

All these questions will have to be considered in very great detail to ensure that such estates really get the benefit of the replanting scheme since we all subscribe towards it in the way of a cess and more so as most mid-country estates are presently running at a loss. I do not consider that anything like enough thought has been given to the problems of districts like ourselves. The scheme has been rather viewed in the light of up-country conditions and good estate management rather than the worst estate management and more difficult soil and climatic conditions. The scheme must succeed from the start and at all costs avoid unnecessary waste on so called replanting by unscrupulous owners with the result that after 5 years or so there is absolutely nothing to show for the money spent.

REPORT BY THE DIMBULA-DICKOYA REPRESENTATIVE

R. C. Scott
(Ottery Estate, Dickoya)

Planting Operations

Prompted by the fact that, for the most part, the poor jat on Ottery, some 70 years of age, is in need of replanting; and, perhaps, even more by the interest and curiosity I had for tea planted vegetatively, I decided to uproot some $8\frac{1}{2}$ acres in No. 5 Field in 1946. The average yield of this field — 34 acres — for the five years 1953/57 was 767 lb. per acre. The area selected had tea which was by no means imposing in appearance or vigour. The soil appears to be loamy.

The $8\frac{1}{2}$ acres are divided into seven Blocks. Blocks Nos. 1 and 2 were uprooted by hand and the remainder by 'Tarpen' Puller. Blocks Nos. 1 to 5 have an average slope of 15° to 20° and Nos. 6 and 7 are much steeper.

As soon as the tea was removed, entirely fresh drains were cut at a slope of 1 in 120 with lock and spill system and at distances apart varying with the slope of the ground. It is very satisfactory that these drains never appear to have overflowed. The bank immediately above the drains is planted with a narrow strip of Paspalam grass which conserves the edges and assists to prevent soil erosion which is negligible.

Blocks Nos. 1, 2 and 3 were planted with *Tephrosia vogelli* for about two years with a view to conditioning the soil, which is not advocated by the Institute by reason of its partiality for eelworm infestation. Unfortunately, a thatch of Guatemala and/or Mana grass was not available.

Sesbania cinerescens provided an early though rather tenuous shade, and *Grevilleas* and *Abizzias* were planted in alternate rows some 15 feet apart and are now well established.

The whole clearing was planted with about 9 months' old material propagated vegetatively in holes about 12" diameter and at distances 5' between and $1\frac{1}{2}$ feet in the rows on the semi-contour. The first plant—Ottery Clone No. 6A -35—were put in on the 23rd December, 1949, by the 'Hersall' method as indeed are all the bushes in the clearing; vacancies have been of minor account.

I regret to say that the nursery beds yielded a very poor percentage of success, due mainly to the fact that the considerable drainage provided in the beds was too deep—some 18" or so below the surface which allowed the soil above the drainage stones to become caked and water-logged. The soil used was jungle which I now think to be a mistake with the added danger of eelworm menace.

The result was that the planting of the Blocks was much delayed, but the growth of the planted area was impressive. As a consequence, in 1951 April, I decided to open a further area comprising Blocks Nos: 4 to 7, and to plant the area at once without conditioning the soil, with the object of getting the area planted as soon as possible and to study the difference in growth and vigour of tea in the conditioned and unconditioned soils. So far as this is concerned there does not appear to be noticeable difference.

The total number of bushes is 48,350 — surface area. Allowing $\frac{1}{2}$ acre for roads, drains, rocks, etc., and taking the acreage as 8, this gives a stand of 6,044 bushes per acre on the plane acreage. Of the 48,350, 41,437 are from Ottery clones, 6,913 T.R.I. clones; of the 6,913, Clone No. 2024 numbers 4,396 and 777, 1,625.

Pruning

In the early stages pruning was done at frequent intervals to encourage spread and later by a careful prune on the slope. So far, secateurs have always been used. With the bushes 18" apart in the rows, the development of branches across the rows is most noticeable advocating, I think, a distance of 24" in preference to 18".

Manuring

During the years 1950/53 manuring was carried out twice per annum in May or June and November or December. The mixtures used were Sterilised Animal Meal—'Black Label'—Sterameal 'A' and TRI 175. Applications varied from N 50, P 72, K 36 up to N 100. In 1954, TRI 175 for bushes upto 3 years of age and TRI 500 for bushes over 3 years were adopted, still with only two applications.

From 1955 to date TRI 175 and TRI 500 only have been applied. There were three applications in 1955 and, since 1956, four with for 1957 N 140, P 64 K 80. Since and including May, 1958, Nitrogen has been stepped up to 200 lb. over the four applications. Forking has always been shallow.

Plucking

The clones were plucked at 36 months from planting in the clearing and thereafter at intervals of 7 days — 53 plucks in 1957.

For obvious reasons it is not an easy matter to keep the leaf plucked separate from each of the clones in all of the Blocks, but, from the start, a careful record has been kept of the yields from the Clones in Blocks Nos. 1, 2 and 3 and of two, including 2024 in Block No. 4. The leaf plucked is, of course, of a high standard — bud and two.

The yields are calculated on a bush-count, taking a stand of 5,750 bushes per acre and an outturn of 23% made tea/green leaf.

Of the clones, Ottery 5-8 (709 bushes) is outstanding with a yield of 1,760 lb. per acre to the end of October, 1958, so that it will give something over 2,000 lb. per acre this year. Whenever manufactured, this clone has the characteristic of making a superb tea with a very bright coppery infusion. At the end of December it will be 44 months from pruning.

TRI 2024 (556 bushes) planted in 1952 has yielded 1,219 lb. to the end of October, 1958, the yield for 1957 was 1,417 lb. We find this clone rather disappointing; the bushes grow quickly, make a rapid recovery from pruning, but have an uneven plucking table, meaning that parts of the table have flushing points whereas other parts are bare of such points. Six other Ottery clones show a better yield than does 2024. I think it only fair to mention that the plucking of this high jat clone has not been up to the standard required.

During the years 1953 to-date the thousands of bushes that have been brought into plucking annually have rather obscured the issue as regards the yield from the total number in plucking. In 1957 the yield was 1,096 and to October 1958 — 1,038 or about 1,300 lb. per acre this year. About 3,500 bushes have yet to come into plucking.

Financial Aspect

I regret I cannot give you an exact figure of what it cost to open the clearing. No expense was spared and the cost was a little in excess of Rs. 5,000/- per acre. And, as regards a return, taking a low figure of Rs. 2/50 per lb. for quality tea such as the clones can produce. In 1956 the value of the teas exceeded the expenditure on the clearing by, in round figures, Rs. 440/- and in 1957 by Rs. 6,500/-.

I wish it to be understood that I do not claim any outstanding success for the Ottery clearing which, to a major extent, I regard as experimental and especially, when one sees in 'Notes on performance of clones' yields well in excess of 4,000 lb. per acre. Needless to say this vegetatively propagated material has been of the greatest interest and education. That the clearing when fully grown and if adequately manured will give a yield approximating 2,000 lb. per acre is, in my opinion, assured.

Since the estate does not appear against "Dimbula District" Notes on performance of clones, I have been asked to refer to the replanting done vegetatively on Diyagama West. 12 acres were planted prior to 1952, 4 acres in 1957/58 and this year 5 acres with T.R.I. clones at one clone per surveyed acre, 21 clones in all. Replanting is done mostly with a transplanter, semi-contour and at distances of $4' \times 2'$.

The two sheets I have before me give the fullest details of the 40 clones listed, including tests after manufacture. Under 'test plucked' the apparent yield per acre in lb. varied from 2255 to 2225.

The undertaking and record is imposing and, so far as I am aware, pre-eminent in the districts for which I have had the honour to speak.

I have tried to present this address as clearly as possible and trust you may have been interested.

REPORT BY THE NUWARA ELIYA REPRESENTATIVE

R. Beadon

(St. Leonards Estate, Halgranoya)

You have already heard some very erudite dissertations on the subject of replanting uneconomic tea and I feel that there is now little that I can usefully add. However, I should like to make it perfectly clear that I am speaking entirely on my own experiences and not on behalf of my district as a whole.

There is very little replanting being done in the Nuwara Eliya District, that I am aware of, except for some of our neighbours, who are here today, and though possibly our respective methods do not quite coincide, I am quite sure we both get equally good results; so what I am going to tell you about is entirely of the work which we have carried out on Eskdale Estate, Kandapola.

The necessity for having to undertake this rehabilitation work was due to tea dying out as a result of a virus disease known as Phloem Necrosis. The field concerned covers a fairly typical lie of land for up-country with the elevation being between 6,700 ft. and 6,800 ft. and as this is rather higher than most estates, our experiences and figures will possibly differ from those at a lower elevation.

We have an annual average rainfall of 86" and the area is subjected to very strong S.W. winds during the period May July — and sometimes even later still. In the first place the tea had to be removed by manual labour as we had not got the mechanical means — that in itself was quite expensive — then the whole area was deep forked and the drains filled in.

The first clearing we undertook was trenched, and in answer to a question raised earlier by Mr. Burroughs, what we did was to plant the tea in between the trenches because if we had not done so we should have encountered the same problems as he did — the earth in the trenches was not firm enough for planting, nor had the vegetation broken down sufficiently; that is to say the Guatemala cuttings. We abandoned trenching after this because I would not say that it proved a roaring success but all the same that clearing is yielding 1,150 lbs. p.a. now in its second year.

Our period of rehabilitation has been 2 years of Guatemala, which we have in plenty so that we have been able to do 'clump' planting as opposed to planting individual stems. These 'clumps' are planted close together along the contour, at a distance of 4' apart. *Tephrosia vogelii* is sown between the rows and the ultimate result is that there is no soil showing and erosion is nil. During the period of rehabilitation there are no drains — these are cut prior to planting the tea.

During the rehabilitation period the Guatemala is lopped twice annually and manured after each lopping according to T.R.I. recommendation at 2½ cwt. of special manure per acre. It is now advocated by the T.R.I. that the dose be increased to 4 cwt. per application. We were unfortunate in meeting a Guatemala pest which, so far as we are aware, has not appeared anywhere else. It is a caterpillar which rejoices in the name of '*Cirphis unipuncta*' — the more common name is

that of the 'Army worm' and I would hasten to add that this attack has absolutely no bearing on recent issues which you might have read about in the papers!

Mr. Austin of the T.R.I. came to our assistance and thanks to his help the attack was brought under control by spraying Arkotine D.18. We now have to await the next breeding season to see whether there will be a recrudescence of them. The grass, when attacked, was 5 ft. or more high, very thick, and it was eaten down to the hard core.

The caterpillars were not easy to get at as they disappeared down the middle of the stems. When we thought that we had that aspect under control we found that they had hidden under the heavy thatch so all that had to be removed and the ground sprayed.

I make mention of this attack because no previous mention has been made of pests in Guatemala and there is yet another which has occurred lower down in the district on Liddesdale Group. They have found that land (not old tea land but patna) which had been rehabilitated with Guatemala had brought the cockchafer grub which attacked the young tea at a later date. The T.R.I. are now rather concerned with this aspect of cockchafer grub in Guatemala because it has been found on Mooloya Estate as well.

At the end of the rehabilitation period the Guatemala is removed and the V.P. plants put out on a modified contour at a spacing of $4' \times 2\frac{1}{2}$ ft. which gives a total of 4,350 plants per acre, but just to show how wrong calculations can be when undertaking replanting work of this nature, we found that in a steepish 1 acre block we were only able to get in about 2,700 plants. So, when estimating what yields are likely, bearing in mind the wonderful calculated yields of 4,000/6,000 lbs. an acre in multiplication plots, it is as well to give a thought as to how many plants you are actually going to get per acre.

When it comes to planting out in bulk it is a very different proposition with varying terrain and soil structure. I mention this in passing, as Mr. Scott told us of some very high average number of plants per acre in his clearings and this would not be possible on my particular lie of land.

All our V.P. plants are basket ones and are put out when around 18" high. Our method of dealing with them during adolescence is to leave them to grow up — no nipping off or thumbnail pruning — when they reach a height of about 2 ft. we bend them over to around 4" to 6" from the ground — all plants bending one way down the line — and as they grow we do a certain amount of lateral bending and pegging as well. Taking the average time in the nurseries at 10 months it has been found that after a further 24 months in the field the bushes are then ready for plucking. Of our first 1 acre block (in its second calendar year) half an acre has given 1,150 lbs. p.a. up to the end of October whilst the other half has given 1,113 lbs. over the same period.

Shade trees are not planted until after the 2-year period in the field has been passed but as a measure of protection from the very strong S.W. winds with which we have to cope, *Tephrosia vogelii* hedges are planted along the rows. These of course may have an adverse effect during a drought but we have to do something. The other method adopted is to put one protection basket on top of another — it may look rather peculiar but it is very effective; on the other hand it is expensive and you would not have to do it on many places.

It has been found generally, at least in my district and most certainly by me, that whereas you can bring a clone down from a higher elevation to a lower one, you don't get the same success when from the lower to the higher. Some of my clones on St. Leonards which is around 1,800 ft. to 2,000 ft. lower than Eskdale have proved quite useless when put out at this higher elevation; on the other hand the Eskdale clones do well on St. Leonards.

All the clones I have used so far have been my own but I have got a T.R.I. experimental Area planted up with T.R.I. 2024 and 2025. They have not been dealt with in the same manner as the clearings proper but even so it was noticeable that they came away slower than my acclimatised clones. The most interesting point is that they have grown well although brought to a very much higher elevation, in contrast to my clones which I have just mentioned.

To sum up, I personally feel, although I know there are quite a number in disagreement, that a 2-year period of rehabilitation is very well worthwhile — we have found it so in spite of the original soil having been reported as being not too bad. If you are going to undertake this clearing work it has got to be done very thoroughly and Major Pyper has my sympathy when he tells us of the problems with which they will be faced with in the Kandy district. It has cost us, on an average, around Rs. 4,600/- an acre from start to finish—that is exclusive of the cost of a V.P. basket plant which comes out at approximately 20 cts.

My own feeling, and I am sure that a lot of others feel the same, is that we have got a long way to go yet before launching out on quite such a grandiose scheme as that, at the moment, envisaged by the Government.

DISCUSSIONS

SABARAGAMUWA REPRESENTATIVE'S PAPER

Dr. Joachim.— Regarding the recruitment of advisory officers for districts as referred to by the previous speaker, I have already referred to this matter in the course of my address this morning. I am sure that the Tea Research Board will be quite willing to consider the question of further advisory staff favourably. It was first mooted at an Experimental Committee meeting by the Uva representatives on that Committee and Uva now wished to reiterate their request to-day. Well, they'll have an opportunity in a few minutes. Sabaragamuwa has stolen a march over Uva by just a few minutes and has also urged the appointment of this advisory staff. I can very strongly support the request, because knowing how the Tea Research Institute is placed at the moment and from my experience of the last nine months, I can say that every officer there is doing more than his full job of work, and it will be quite impossible for them to undertake, in addition, the responsibilities which this very important scheme will necessitate.

UVA REPRESENTATIVE'S PAPER

Mr. Tolhurst.— I quite agree with the Uva delegation in what they say about the necessity for soil analysis. Not so much chemical analysis, that is why I am talking about it, but physical and pathological analysis. I think they've got to be considered as a whole. It's no good analysing the field soil unless you also have some knowledge of the soil in the planting holes, and it is no good doing that unless you have some knowledge of the soil in the nurseries. The responsibility really falls on the Vegetative Propagation Officer and his staff. I think that physical analysis on the nursery soils and also on the soils in the field could be of more value than chemical analysis. It is easy enough to do physical analyses to see what the structure of the soil is, to see how compact it is, but there is no point doing them unless you can say what the results will mean when applied to the behaviour of the plant growing under certain conditions.

To evaluate the effect on the establishment and the well being of the tea plants, the only way is, as I have said earlier today, by trial and error. So that anyone who does the analyses should also be a man, (or men rather), who is competent to keep systematic records. And I mean records of all factors connected with the growth of vegetative propagation, not only soil conditions, but also methods of bringing into bearing, pathology, climate, the nature of a particular clone, etc. The Acting Director has just said something of what I thought perhaps I might have to say, namely that I don't want any more staff to do that specific work. I have got more than enough work to keep a large staff busy on mature tea which has not yet been pulled out. Any analyses which are done on soil, and on young plants in such an extensive replanting scheme, must, I feel, be done in a section or sub-section all on its own. I will give all the help I can and suggestions as to the methods of analyses and I hope we can get a team of men as competent as possible to get on and collect some of this information as soon as possible.

Dr. Visser.— We cannot identify clones as such; we could identify some clones. That of course is not the question which was asked. The official approval of clones so far has been done by the Tea Research Institute on the basis of testing them out in our multiplication plots. A number of T.R.I. clones have

already been approved and it is to be expected that a number of other clones both selected at St. Coombs and on estates will be added to this list in the near future. We are lagging behind on quality tests due to lack of staff, but we are doing the best we can. With respect to clones selected or established on the different estates we have on account of our circular a broad knowledge as to their whereabouts and (some of) their alledged qualities, but nothing more than that.

It will not be possible for the Institute to test and approve these clones within a reasonable time. The suitability of estate clones for replanting purposes will be ascertained in a different manner which will be dealt with by the Tea Controller some time later.

Question.— Will disease increase by leaving the tea abandoned instead of uprooting it ?

Dr. Mulder. — I think you would get more blister blight in the beginning, (on the growing shoots) but little or no blister blight later. I do not know what the position would be with regard to other diseases and pests if tea were allowed to grow into trees.

Question. — May I make myself clear ? There is no question about leaving tea in an area to be replanted. It is only if a certain area which it is intended to abandon and you want to plant an alternative area, will it be possible under the law to leave that area un-uprooted ? What I want to know is if land under tea is too steep for replanting and you want to abandon it could we use a similar area in another place ?

The answer was deferred till after Mr. Mahadeva's paper.

Mr. R. D. Wedd. — I suggest the poisoning of tea that is not wanted as uprooting would erode the soil.

Dr. Visser. — We have been trying out weedkillers and we find that some weedkillers are very effective in killing tea. If you want to poison tea, I have no doubt that it can be done, but this method will need careful consideration because of root diseases.

KELANI VALLEY REPRESENTATIVE'S PAPER

Mr. D. W. G. Burroughs. — Would Mr. Bean tell the meeting whether he considers taking into account the return for money spent, that resupplying old tea is likely to give better returns than replanting ?

Mr. R. J. S. Bean. — My experience is that the money would be definitely better spent in replanting. This was confirmed by Mr. Sutherland.

Mr. P. Dalton. — Is it not the case that vegetatively propagated material takes as long a time to come into production from the nursery stage as seed ?

Mr. Bean. — I disagree with you there Mr. Dalton. The seed goes straight into the field — in the case of seed-at-stake after germination in the nursery bed, and your cutting goes into your original nursery bed and, I would prefer it to stay there until it goes straight out into the field, although I know there is an intermediate technique practised in some districts whereby you put it in baskets and the baskets go into the field, although this sets it back a bit. I think generally speaking the

experience in the low-country at any rate has been a saving of up to a year in maintenance, bringing in your tea after two calendar years. I don't know of seedling tea brought into real production, though it may be brought into premature production, quicker than that.

The point is that V.P. is normally one year old at least ex-nursery which gives it a year's growth advantage over seedling tea which is usually planted out as germinated seed. A year's maintenance costs in the field are thus saved.

Dr. Visser.—Mr. Bean, can you tell us something about the two adjacent areas at Ederapolla—clonal and seedling—in respect of which you have data?

Mr. Bean.—The area Dr. Visser refers to is a seedling area of 28 acres planted out in 1948 at the same time as $2\frac{1}{2}$ acres of V.P. The V.P. plants were visual selections from Ederapolla. These areas are side by side; they were contiguous and the treatments that were meted out to both were identical as regards planting out and methods of bringing into production. To see them side by side you would think they are similar in appearance, except just prior to plucking when the plucking points on the V.P. area were noted to be very much closer together. The last comparative figures I have on these were 2,847 lbs. per acre for the V.P. as against 1,265 lbs. per acre for the seedlings. In appearance and in vigour they were exactly the same. I think these figures do give some indication, because I was careful to treat these two areas in exactly the same way up to the time of production.

KANDY DISTRICT REPRESENTATIVE'S PAPER

Dr. Joachim.—Mr. Gordon Pyper mentioned in his paper the need for more information and knowledge on V.P. in the problem areas of the Kandy District. There is no question about it that this is a problem area. I have been round Major Pyper's estate myself and he has probably the best V.P. area in the district; but there are many problems he has to contend with, and there are many estates much more difficult than his, and results have in many cases been disappointing. In order therefore to help them solve their problems, the Tea Research Institute has decided to establish a V.P. unit in the Kandy District. For this purpose we have asked the co-operation of the Kandy P.A. in selecting a plot which is fairly typical of the area, because there is no such thing as one typical area in the Kandy district. There are three climatic zones, if I may use that word, within the district, but it is not possible at this stage of our development for us to provide 3 V.P. units. We propose very shortly to start with one and we can only assure Major Pyper that we will do our best to help the planters get on with this work as early as possible.

NUWARA ELIYA DISTRICT REPRESENTATIVE'S PAPER

In answer to a question raised regarding T.R.I. clones grown outside St. Coombs, Dr. Visser replied that the information available was conflicting. The response to a questionnaire issued to several estates resulted in only one estate, of 25, replying that the performance of 2024 was disappointing. Verbal reports received since then corroborate this statement. But it must be remembered that St. Coombs clones are grown at an elevation of 4,500 feet minus shade. And further quite a number of our clones are now being grown at lower elevations and with shade. But the fact is that we do not possess sufficient data relating to our clones grown outside St. Coombs and therefore, for the present, we are unable to make a definite pronouncement on their performance.

NOTES ON THE RAISING OF TEA PLANTS VEGETATIVELY*

D. S. Sutherland
(Craighead Estate, Nawalapitiya)

Now that the Tea Subsidy Act No. 12 of 1958 has come into force it is probable that Superintendents of tea estates, who have not previously done much work on the propagation of tea vegetatively, will be encouraged to try this work. The first attempts are likely to prove disappointing and the following notes may be of some help to them.

Supervision is very important and few Superintendents can spare the time for direct supervision of a V.P. nursery of any size.

Labour employed in a nursery should work there permanently as it is mainly continuous practice which gives the touch necessary for success. Casual labour is usually worse than useless.

Cuttings can be calloused in beds of sand, jungle soil, ordinary estate soil or specially prepared soil with a view to transplanting to baskets. Or they can be put straight into baskets, or calloused and rooted at spacing which will allow for the use of a transplanter. Conditions vary so much from estate to estate and even within the boundaries of one estate that all methods should be tried until the most successful one for that particular nursery has been found.

Good drainage of nursery beds is of paramount importance and more plants are killed by over watering than by under watering. Even with good drainage little success can be expected from cuttings put out in beds or baskets shortly before or during periods of heavy rain.

Cuttings should never be forced into the soil. A piece of wire or ekel should be used as a dibble and earth must be compacted sufficiently to hold the cutting firmly. Shade should be provided immediately the cuttings are put into the beds or baskets. As a rule, better results can be obtained if cuttings are allowed to remain undisturbed in the callousing bed for from 3 to 6 months before transferring them to baskets.

Baskets can be treated to last for the usual 9 months necessary to get a good plant, by dipping them in a solution of copper sulphate (8 lbs. to 40 gallons of water) for 5 minutes and allowing them to dry thoroughly before filling. They will also keep better if they are packed in gravel to hold them upright in the bed.

* Submitted subsequent to the Symposium.

The Institute does not necessarily endorse the views expressed in papers contributed by persons other than members of the staff.

When transferring rooted cuttings from the callousing beds to the baskets, earth should be removed from the basket in such a way that the roots of the cutting can be positioned to their normal habit of growth before earth is poured back into the basket. It is preferable to use dry earth for this purpose. After the rooted cuttings are showing signs of growth in the baskets this growth can be greatly encouraged by the application of a level teaspoonful of fertiliser at monthly intervals.

If more cuttings have been obtained than can be conveniently put out at once, or, if weather conditions become unsuitable, cuttings can be kept in sealed polythene bags for periods of up to a fortnight, without much deterioration in the rooting qualities. Care must be taken to prevent direct sunlight striking the bags as it will scorch the cuttings very quickly.

It should be remembered that about 6 lbs. of soil will be removed with each plant and that provision to replace this must be made if the nursery is to continue in use.

It is preferable to keep basket plants upright when transporting them from the nursery to the field. Wooden boxes for the transport of plants have to be well made to stand up to the misuse which they normally receive. They also tend to gain in weight very quickly during use as planting is normally done in wet weather. A good type of receptacle to transport plants can be made from the type of tar barrel used by the P.W.D., cut into 3 sections with a wooden bottom fitted to the middle section. These can be used for 3 seasons or more. If baskets disintegrate during transport from the nursery to the field, it is inadvisable to ball the earth round the roots of the plant as this nearly always damages them to such an extent as to make the plant useless.

The plant should be planted as carefully as possible keeping the roots in the position in which they have grown. Great care must be taken to see that plants are not planted too deeply. This is a common fault. Good after care is essential. The greatest enemy of a young tea plant is the average estate labourer, and protection against weeders particularly is essential. If they do not scrape the bark off they will usually manage to scrape earth round the stem and eventually choke the plant. If that doesn't kill it they will try standing on it. Wooden pegs are normally considered a convenient source of firewood but bamboo pegs are often left long enough to do some good. Rock fern is as good a protection as any but should be kept in place for nearly 12 months.

A frequent application of fertiliser, say every 2 or 3 months, increases growth tremendously. It is essential when supplying in old tea as young supplies have so much competition from surrounding established tea that they are unlikely to survive without adequate help. Thatching, though expensive, is of great help in establishing young plants but care must be taken to keep it away from the stems as often the bark will rot where the thatch touches it. Given good plants, moderately good weather conditions and treatment as suggested, it is possible to lightly pluck plants which have been in the field for 27-30 months.

Clonal material appears to be susceptible to elevation and a clone which is suitable for planting below 4,000 feet may not do so well above 4,000 feet. However, it is possible to acclimatise clones and if the 1st generation is not very successful the 2nd or 3rd may be successful.

Failure to obtain success in vegetative work by one method should not mean the end of the experiment.

There are so many ways of doing this work that they should be tried one after the other until success is achieved.

Successful results are so rewarding that they are well worth all the trouble entailed.

THE ADMINISTRATIVE ASPECTS OF THE REHABILITATION AND REPLANTING SCHEME

B. Mahadeva
(Tea Controller)

I was very happy indeed when the Tea Research Institute decided to hold this Symposium to mark the inauguration of the Government's new Tea Rehabilitation Scheme, and invited me to address you briefly this afternoon regarding the administrative aspects of the new Scheme.

I do not propose to inflict a long speech on you. I propose to make only a few brief remarks describing the Scheme in very broad outline and to answer some of the more *general* questions which were raised by various representatives of the planting community this afternoon. Thereafter, I trust, Mr. Chairman, that you will throw the subject open for discussion so that any other more *detailed* questions can be raised, and, if possible, answered by me.

The new Tea Rehabilitation Scheme is the third and last of the Rehabilitation Schemes which have been launched by the Government in recent years for the rehabilitation of the Island's plantation industries. The first of these Schemes—the Rubber Rehabilitation Scheme—was launched as far back as 1953. That Scheme, as originally planned, aimed at the replanting of 65,000 acres of uneconomic rubber in the five-year period from 1953-57. This target acreage has been greatly exceeded. More than 90,000 acres were planted in the first 5 years and it has now been decided to extend the Scheme for a further period of 5 years from 1958 onwards and to replant a further 110,000 acres—making a total of 200,000 acres replanted in the 10-year period 1953-62. On the basis of these figures you will, I am sure, agree that the Rubber Rehabilitation Scheme has been quite a successful one. The second of the Government's Rehabilitation Schemes, the Coconut Rehabilitation Scheme, was launched only 2 years ago—in 1956. The response to this Scheme too has been quite satisfactory. Last year, we distributed 32,000 tons of subsidised fertilizer and over a million high-grade coconut seedlings to owners of coconut estates and small-holdings. This year we hope to increase the quantities to 40,000 tons of subsidised fertilizer and about 1,200,000 subsidised seedlings which would be sufficient to replant about 20,000 acres of worn-out coconut land. ^a

In both the Rubber and Coconut Rehabilitation Schemes, the *type of assistance* given to large estates was exactly the same as the type of assistance given to small-holdings and small estates. The actual rates of subsidy may have varied but the type of assistance was essentially the same.

In the case of the new Tea Rehabilitation Scheme, on the other hand, it was felt that there should be *two distinct types* of assistance - one for large estates over 100 acres in extent and the other for small estates and small-holdings under 100 acres in extent. The reason for this is that the type of assistance required by owners of small tea estates and tea small-holdings is of an entirely different nature from that required by the larger estates.

A Subsidy Scheme under which cash subsidies would be paid for replanting with V.P. material would have been of little value to tea small-holders. A tea estate with a fairly large acreage can afford to uproot a relatively small part of its total acreage and replant it with high-yielding tea. The vast majority of tea small-holders, on the other hand, who own just 2 or 3 acres of tea and are completely dependent on the income from this tea for their livelihood, cannot afford to uproot the old tea and wait with no income until the new tea comes into bearing. Quite apart from this consideration, I think it will be generally agreed that the majority of tea small-holders do not possess the high degree of technical skill which is necessary for replanting their holdings with V.P. material.

What owners of small-holdings and small tea estates do require, and would probably prefer to receive, are not subsidies for replanting but generous financial assistance for the improvement of the agricultural condition of their holdings. They require assistance for the adoption of soil conservation measures, for supplying vacancies on the land and increasing the very low stand of tea bushes per acre, for the generous application of fertilizer and so on. Assistance will be given for these purposes under the new Tea Rehabilitation Scheme to the extent of Rs. 650 per acre. I do not think that the majority of the representatives of the tea industry present here this afternoon are directly interested in this part of the Rehabilitation Scheme -- the part dealing with small-holdings and small estates under 100 acres in extent. I shall not therefore take up any more of your time in giving the details of this part of the Scheme.

I turn next to the second part, the part dealing with tea estates over 100 acres in extent, which is by far the larger and more important part of the new Tea Rehabilitation Scheme. In marked contrast to the Island's rubber and coconut industries, the tea industry of Ceylon is predominantly a large-estate industry. In the case of coconut, hardly 20% of the total acreage is on estates over 100 acres in extent. In rubber, the percentage is in the region of 50%. In tea, on the other hand, 80% of our total tea acreage is on estates over 100 acres in extent and more than 90% of our total crop comes from these estates. There are altogether about 940 estates over 100 acres in extent and their average size is about 500 acres each. Major Pyper mentioned that there were some estates in this group, particularly in the Kandy district, which were not efficiently managed and expressed the view that it would be a waste of money to give these estates any subsidies for replanting. I feel, however, that these exceptions are few and far between, and that, as a general rule, the Island's large tea estates are most efficiently managed. The spectacular increase in the yields of these estates over the last 20 years to which the Minister of Agriculture and Food referred in his speech this morning—is an index to the efficiency with which these estates are managed. Clearly these estates do not require monetary inducements, as small-holders do, to adopt improved agricultural methods. They have already gone to what is probably the farthest possible limit in increasing yields by the application of fertilizer, by the adoption of improved disease control techniques and so forth. The time has already come or will come very soon when further increases in yield cannot be obtained by the adoption of improved techniques on the existing tea: further increases in yield can come only by replanting part of the acreage of these estates with the newly-developed high-yielding clones. Hitherto, little or no replanting had been done on tea estates in Ceylon. The purpose of the new Replanting Subsidy Scheme which the Government has just launched is to induce our larger tea estates to embark on regular replanting programmes under which they will replant at least a small percentage of their total acreage each year with the newly-developed V.P. clones.

The subsidy paid for replanting will be Rs. 2,500 *per acre*. As I mentioned this morning, this figure was suggested to the Ministry of Agriculture in a joint

memorandum submitted by the Planters' Association and the Low-Country Products Association. It is true that these Associations intended that the subsidy should come out of the export duty and that no additional cess should be levied but that, as I said this morning, is a case for the reduction or adjustment of the present export duty and not for an increase in the rate of subsidy.

I presume that in suggesting the figure of Rs. 2,500 per acre, the planting community felt that this rate of subsidy would provide a sufficient inducement for estates to embark on regular replanting programmes. I might mention incidentally that the subsidy of Rs. 2,500 per acre will be free of Ceylon income tax. This means that estates which pay Ceylon income tax will have a double benefit — the expenditure on replanting will be an allowable deduction for tax purposes and the subsidy itself will not be reckoned as income for tax purposes. In other words, to a Company which pays income tax and profits tax at the 50 per cent. level, the subsidy of Rs. 2,500 per acre would in effect be equivalent to a subsidy of Rs. 5,000 per acre. (Since these remarks were made at the symposium, it has been learnt that even Sterling Tea Companies which are registered with the U.K. Government as Overseas Trading Corporations would be entitled to receive tax concessions similar to those they would have enjoyed if they were Companies registered in Ceylon).

The subsidy of Rs. 2,500 will be paid in *six instalments*. The first instalment of Rs. 500 will be paid after the old tea on the land has been uprooted. The second instalment of Rs. 750 per acre will be paid after the necessary soil conservation measures have been adopted and the land has been prepared for replanting. The third instalment of Rs. 500 per acre will be paid as soon as the replanting has been completed. Thereafter, the last three instalments, which will be smaller instalments of Rs. 250 each, will be paid at annual intervals provided the replanted area has been satisfactorily maintained.

Each instalment of the subsidy will be paid, as in the case of the Rubber Replanting Subsidy Scheme, after an inspection of the area replanted. The inspection of clearings under the Rubber Replanting Scheme is done, as you are probably aware, by experienced planters who are generally the Superintendents or Assistant Superintendents of rubber estates over 300 acres in extent. I feel that the decision of the Rubber Replanting Board to employ experienced planters for these visiting duties, instead of employing an army of poorly-paid Government Inspectors, was a wise one. It has practically eliminated allegations of bribery and corruption under the Scheme. This, you will agree, is a matter of the greatest importance in a Scheme under which 200 lakhs of rupees are paid out each year. I hope to be able to adopt a similar system for the inspection of areas replanted under the Tea Replanting Subsidy Scheme. Mr. Coombe, in the course of the remarks he made this afternoon, envisaged the possibility of employing technical officers in the Tea Control Department to undertake these inspections. I do not think that this would be a good idea. For one thing it would be very difficult to obtain the services of the right type of person who would be in a position to adjudicate on the work of experienced planters, and even if it were possible to obtain the services of the right type of person I do not think that the planting community would welcome an arrangement of this type. I think it would be much better to follow the practice that we have been following under the Rubber Rehabilitation Scheme of getting these inspections done by actual working planters most of whom would probably be carrying out work under the Replanting Scheme on their own estates. Mr. Coombe also expressed a doubt on whether these planters would have the necessary time to undertake these inspections. I do not think that any difficulty will arise on this score. Unlike in the case of the Rubber Replanting Scheme where the number of inspections is extremely large because small-holdings are participating in the Scheme, in the case of the Tea Replanting Scheme there will be only about 940 estates eligible

to participate and I doubt whether more than half these estates will actually participate, at least in the earlier stages of the Scheme. There are up to 300 tea estates in Ceylon over 500 acres in extent and if the majority of the Superintendents of these estates agree to serve on the panels of Inspecting Officers, then there will be about 300 Inspecting Officers for about 500 estates participating in the Scheme. The number of inspections which each Inspecting Officer will have to undertake will not therefore be large and the inspections will not involve a serious drain on his time and energy. I do hope that the majority of Superintendents of estates over 500 acres in extent who will be invited to serve on the panels of Visiting Agents will agree to do so.

The requirements for the payment of the various instalments of the subsidy are laid down in the regulations framed under the Tea Subsidy Act, which were published in the *Government Gazette* of 7th November, 1958, and will be presented to Parliament for approval next week. These regulations were framed on the advice of a Committee appointed by the Tea Research Board on which the Director of the Tea Research Institute and several experienced planters, including Messrs. Ross, Sanders and Coultas, served. The intention of the Committee in framing the regulations was to make the regulations as simple and flexible as possible. It could not have been possible, and would not have been desirable even if it were possible, to make these regulations too rigid at this stage. For instance, there are two specific matters on which the regulations are completely silent. The first of these is on the question of the period which must elapse between the uprooting of the old tea and the planting of the new tea. It was evident from the discussion we had this morning that there are wide differences of opinion on this subject. Conditions vary widely from estate to estate, and from clearing to clearing. In some cases it may be possible to plant the new tea almost immediately after the old tea has been uprooted; in other cases it may be necessary to allow a period of 2 years or more to elapse before the new tea is planted. We felt that it would be best not to specify any minimum period in the regulations but to leave the discretion in this matter to the individual estates. If the Inspecting Officer who visits the land disagrees with the Superintendent of the estate on the period which must be allowed to elapse for the reconditioning of the soil, then it has been suggested that the matter should be referred for adjudication by a panel of experienced planters to be appointed in each planting district. I hope that such disputes or differences of opinion between the Superintendents of estates participating in the Scheme and the persons who inspect the land will be very few and far between. But if such disputes occur then some machinery would be necessary for arbitration. The alternative to a panel of planters in each planting district would be arbitration by the technical officers of the Tea Research Institute but the adoption of this procedure may place an undue burden on the staff of the Institute. In any case, I am sure that matters of this type could not be decided by the officers of the Tea Control Department and that therefore it would be best to refer the matter for decision either by a panel of planters in each planting district or by the officers of the Tea Research Institute.

The second question on which no specific regulations have been laid down is on the question of approved varieties of planting material. When the Rubber Replanting Subsidy Scheme was started, it was a relatively simple matter to select 8 or 9 standard clones which had been found to give satisfactory results in the various rubber-growing districts of Ceylon and to specify that these standard clones were the clones approved for use under the Scheme. Unfortunately, the selection and development of tea clones has not advanced sufficiently far to enable a similar selection to be made in the case of tea. We have therefore decided not to specify a list of approved clones in the regulations framed under the Tea Subsidy Act. Here, too, we felt that the discretion could be left to each individual estate. If there is any difference of opinion between the Superintendent of the estate and the Inspecting

Officer who visits the estate on the suitability of a particular clone, the matter could be referred for adjudication either to a panel of planters to be set up in each planting district or to the technical officers of the Tea Research Institute.

I would like to hear the views of the representatives of the planting industry present here this afternoon on the proposal to set up panels of planters in each planting district to adjudicate on any disputes which may arise either on the question of the period of time which must elapse between the uprooting and replanting of the tea, or on the suitability of a particular clone for use under the Replanting Scheme. I must emphasize that the final decision on this proposal will have to be taken by the Tea Subsidy Board which is to be set up very shortly under the Tea Subsidy Act, but I would like to hear the views of the representatives of the industry present here before a final decision is taken.

I mentioned, in reply to the question raised by Major Pyper, that the Tea Control Department would not employ any technical staff to undertake the various inspections necessary before the instalments of the subsidy are paid. A connected question which was also raised this afternoon was whether the Tea Research Institute would employ additional technical staff for advisory work under the Replanting Scheme and for the analysis of soil samples, etc. which may be sent by estates participating in the Scheme. It is quite clear that, under a Replanting Scheme of the magnitude now envisaged, a great deal of additional work will be thrown on the staff of the Tea Research Institute and that the Tea Research Institute will have to expand its staff in order to meet the increased demands for advisory work and for soil analyses, etc. I believe that the Tea Research Institute has already drawn up a scheme for setting up a new Advisory Division and appointing a Chief Advisory Officer to take charge of the Division. Dr. Joachim inquired whether part of the cost of the staff and of any additional staff which may be recruited for soil analyses, etc. could be met from the funds of the Tea Rehabilitation Scheme. I myself see no serious objection to this proposal but a final decision on the subject must, of course, be taken by the new Tea Subsidy Board after the Board has been appointed.

The next question I would like to discuss is the *target acreage* to be replanted under the Scheme. As the Minister of Agriculture mentioned this morning, it is hoped to replant a total of about 30,000 *acres* in the next 5 or 6 years, at an annual rate of 5 to 6 thousand *acres* a year. There are some who have said that the target is too high; others have said that the target is too low as compared, for instance, with the present rate of replanting of about 22,000 *acres* under the Rubber Replanting Scheme. I myself am of the opinion that the target is not too high; if anything, it has been set too low. This relatively modest target has been fixed, partly because, at the time the Scheme was drawn up, the Planters' Association and the other representatives of the planting industry felt that, in view of the very limited experience of replanting which estates possessed, it was unlikely that a higher target could be reached, and partly because the Tea Research Institute advised us at the time that high-grade planting material would not be available for replanting a larger acreage, at least in the early stages of the Scheme. It now appears that the second anticipation was rather over-cautious. The figures more recently collected by the Tea Research Institute and the Tea Control Department indicate that V.P. material will be available for planting an area considerably in excess of 5 or 6 thousand *acres* a year. Nevertheless, I think that we should stick to the original target at least in the early stages of the Scheme, and revise it at a later stage when we have more experience of replanting with V.P. material.

I said a while ago that there were about 940 estates over 100 *acres* in extent in the Island and that probably half these estates would participate in the Scheme. If this happens, then each estate must replant *at least 2 per cent. of its total acreage*

each year in order to achieve our target of replanting 5 to 6 thousand acres a year. An estate of 500 acres, for example, must replant at least 10 acres a year. I want to make one point perfectly clear. This figure of 2 per cent. which we are talking about is just an *average* percentage. There may be some estates which would choose to proceed very cautiously and plant less than 2 per cent. of their total acreage each year. There may be other estates who already have considerable experience of planting with V.P. material and are prepared to plant much more than 2 per cent. of the acreage each year. I was talking to a very experienced planter this morning who told me that he would be able to plant something like 5 to 6 per cent. each year. This may be an exceptional case but certainly there are quite a number of estates prepared to plant more than the normal 2 per cent. I mention this average figure of 2 per cent. because those of you who are now preparing to make applications for replanting permits in response to the press advertisements which appeared recently, might require some guidance on the area for which they should make application. I strongly urge you to send your applications to cover at least 2 per cent. of the total acreage of your estate and try to plant at least this acreage each year. Unless this is done it would not be possible for us to achieve the target of replanting 5 to 6 thousand acres a year which we have set up to achieve under the Scheme and a part of the funds which estates are contributing to this Scheme would be left unutilised.

There were two questions raised regarding applications for replanting subsidies and the issue of replanting permits, which I can appropriately answer at this stage. The first question related to what I term "replacement." By "replacement" I mean the planting of new tea on a land which is at present in jungle or in some other crop and the simultaneous or subsequent eradication of an equivalent acreage of old tea elsewhere. Under the Tea Subsidy Act, such planting qualifies for subsidies. The questions raised regarding this are (1) whether the equivalent acreage of old tea elsewhere has to be eradicated *at the same time* as the new tea is planted, and (2) whether it was compulsory to *uproot* the old tea or whether it would be sufficient if the tea was poisoned or eradicated in some other way. The answer to the first question is that it is not necessary to eradicate the old tea simultaneously with the planting of the new tea. It will be sufficient if the old tea is eradicated at the time when the new tea comes into bearing. As regards the second question, I myself feel that it will be better not to uproot the tea in the old area and thereby disturb the soil and cause soil erosion but this is a question on which I would like to consult the Tea Subsidy Board before a final decision is given.

Another connected question which was raised is whether replanting permits will be issued and replanting subsidies paid for replanting old rubber lands with tea. The answer to this is quite simple. A person who does not have any tea at all, but who owns rubber would not be paid subsidies for uprooting part of his rubber and replanting it with V.P. tea. This is because such a person does not contribute towards the Tea Replanting Fund and therefore is not entitled to receive any monies from the Fund. The position is quite different in the case of a person who owns both rubber and tea. Such a person could instead of uprooting part of his tea land and replanting it with V.P. tea, choose instead to uproot an equivalent acreage of old rubber land, replant that area with V.P. tea, and either simultaneously or subsequently eradicate an equivalent acreage of old tea elsewhere. This would constitute "a replacement" and the person concerned would be entitled to subsidies under the Tea Subsidy Act.

I mentioned a while ago that the target acreage to be replanted under the Scheme was 30,000 acres in the next 5 or 6 years. I said that this target was a relatively modest one when compared with the acreage being replanted under the Rubber Replanting Scheme. The benefits which will accrue to the country from the replanting of this 30,000 acres will, however, be quite substantial. On

a conservative estimate, the increase in Ceylon's annual tea production will be of the order of 40 million lb. worth at to-day's f.o.b. price about Rs. 100 million. In addition to this increase in the national income, the replanting will provide very considerable additional employment opportunities.

What will be the *total cost* of the proposed Tea Rehabilitation Scheme? The subsidies payable on the 30,000 acres to be replanted in the next 5 or 6 years will be Rs. 75 million. When the cost of administration, etc., is added, the total cost of the Replanting Scheme for estates over 100 acres in extent will be a little less than Rs. 80 million. The Rehabilitation Scheme for small-holdings and small estates under 100 acres in extent will cost something like Rs. 20 million, so that the total cost of the Scheme will be in the region of Rs. 100 million. I mentioned that the value of the increased annual tea production would, on a conservative estimate, be in the region of Rs. 100 million. In other words, the entire cost of the subsidies paid under the Scheme will be less than the value of one year's increased production. I mentioned these figures to underline an important fact. They prove that a comparatively small investment on the rehabilitation and development of our plantation industries can yield quicker and richer returns than a comparable financial outlay in any other sector of the country's economy.

The expenditure on the Tea Rehabilitation Scheme will be met from a cess of 4 cents a lb. on exports of tea. The legislation for the imposition of this cess — The Tea Subsidy Act, No. 12 of 1958 — was approved by Parliament several months ago — in April this year to be exact — but the Planters' Association and other planting bodies requested the Minister to defer the implementation of the Act because of the prevailing depression in tea prices and the Act was finally brought into operation only a few weeks ago. The regulations under the Act have also been framed and will, as I said earlier, to be presented to Parliament for approval next week.

I might mention, that under the Tea Subsidy Act there will be a Statutory Board — the Tea Subsidy Board — which will function on exactly the same lines as the Rubber Replanting Board set up under the Rubber Replanting Subsidy Act. The Board will consist of the Tea Controller, the Chairman of the Tea Research Board, the Director of the Tea Research Institute and 2 or 3 other experienced planters. I am very happy that the Planters' Association has nominated Mr. Bean, who possesses very extensive experience of V.P. work in the low-country, as its representative on the Board. I am awaiting a nomination from the Low-Country Products Association of its representative. I hope that the Board will be formed in the next 2 or 3 weeks and will hold its first meeting before the end of the year. Once the Board has been formed, it will be possible for me to give final answers on some of the detailed questions relating to the Scheme on which I have been able to give you only tentative answers this afternoon.

I have attempted, Mr. Chairman, to give you a very brief outline of the Tea Rehabilitation Scheme and to answer some of the general questions which were raised regarding this Scheme during this afternoon's discussions. I shall be very happy to answer any further questions that you may wish to raise. Before I conclude, however, I wish to emphasise again what the Minister of Agriculture emphasised in his speech this morning, namely, that this Scheme is entirely your Scheme and that the entire success of the Scheme will depend on the enthusiastic and whole-hearted support and co-operation of the planting community. This Scheme is not really a Government Scheme at all. Although the machinery for the operation of the Scheme is being worked through a Government Department, the money for the Scheme is being provided by the tea industry and the actual working of the Scheme will be in the hands of experienced working planters. The entire success of the Scheme will depend therefore on the support and co-operation of the planting community. I have not the slightest doubt that this support and co-operation will be forthcoming in full measure. Thank you.

DISCUSSIONS

MR. MAHADEVA'S PAPER

Mr. W. H. W. Coultas.— It was stated that the rate of subsidy, namely, Rs. 2,500 per acre, was fixed on the advice of the P.A. and the L.C.P.A. Is it too late now to have this amount increased ?

Mr. Mahadeva.— If the rate of subsidy is increased, this would involve *either* an increase in the rate of cess *or* a reduction in the target acreage. One of these two things must happen — either the cess must go up or the target acreage of 30,000 acres to be replanted must come down.

I should mention in this connection that there is provision in the Tea Subsidy Act for the Government to vote monies into the Tea Subsidy Fund over and above the proceeds of the cess levied under the Act. I do not think, however, that we can seek Government assistance for this Scheme at this stage. In the case of the Rubber Replanting Scheme, the Scheme was originally financed entirely by a cess on rubber exports. It was a very high cess; it was initially 10 cts. a lb. and was later raised to 15 cts. a lb.

The levy of this cess was continued for a period of nearly 5 years, but at the end of last year, owing to the severe depression in the rubber market, the levy of the cess was discontinued. From the beginning of this year the Rubber Replanting Scheme is being financed partly from funds provided by the Chinese Government, amounting to approximately Rs. 15 million a year, and partly from funds voted by the Ceylon Government, amounting to approximately Rs. 5 million a year. The rubber industry itself now contributes nothing at all towards the cost of the Rubber Replanting Scheme.

If at a later stage, we are short of funds for the Tea Rehabilitation Scheme, then we can probably make an application either to the Ceylon Government or to some foreign Government for assistance for the operation of the Scheme. But I do not think that an application for increased funds could be made at this stage. Nor do I think that we should reduce our target acreage for replanting under the Scheme. Unless therefore the cess on tea exports is to be increased, the rate of subsidy will have to remain, at least for the present, at the rate of Rs. 2,500 per acre.

Mr. C. H. Irvine.— In the notice published by the Government it was stated that no subsidy will be paid in respect of land replanted prior to 1st January, 1959. Will the first instalment of the subsidy (Rs. 500 per acre) be paid on land planted after 1st January, 1959, but uprooted before that date ?

Mr. Mahadeva.— When the Rubber Rehabilitation Scheme was originally started, we fixed a certain date — I think it was 1st January, 1953 — and said that lands which were replanted after that date would qualify for the payment of replanting subsidies and that the first instalment of the subsidy which is paid for the uprooting of the old rubber can be paid in respect of such land provided the uprooting was done within a specified period (I think it was 2 years) prior to the date of replanting.

A similar arrangement could be arrived at in the case of the Tea Replanting Scheme. The first instalment of the subsidy can be paid even if the old tea on the land has been already uprooted provided the uprooting was done within (say) the last 2 years. I do not think, however, that the first instalment of the subsidy can be paid in the case of land uprooted (say) 15 years ago and replanted in 1959. This is one of the questions which I would like to place before the Tea Subsidy Board for consideration.

Mr. Irvine.— Would it not be unfair to confine the period to (say) 2 years, particularly in respect of eelworm affected areas ?

Mr. Mahadeva.— I merely suggested a period of about 2 years. As I stated earlier this is a matter on which a final decision will be taken after the new Tea Subsidy Board has been appointed.

Mr. R. D. Wedd.— Would it be fair to pay subsidies only in respect of land replanted after 1st January, 1959 ? Could the subsidy not be paid also in respect of areas replanted prior to 1st January, 1959—during the current North-East monsoon planting season ?

Mr. Mahadeva.— I would personally have no objection to the date 1st January, 1959, being changed to 6th October, 1958, the date on which the new Tea Subsidy Act came into operation. This would mean that a land replanted with V.P. material after 6th October, 1958, would be eligible for replanting subsidies under the Tea Subsidy Act, provided the replanting was done on a Replanting Permit issued by the Tea Control Department. I do not think that the area replanted between 6th October, 1958, and 1st January, 1959, will be large. It will probably be a matter of 25 to 30 acres in all.

You will excuse me, Mr. Chairman, if I digress at this point to refer to the terms which we are using regarding the new Scheme. I think it would be very desirable for the Tea Research Institute, the Tea Control Department and the planting community to standardise the terms which we use.

For instance, the word “rehabilitation” is used in several senses. We use the term “rehabilitation” in a very general sense to cover any measures to improve the condition of a tea area whether by replanting or by application of fertilizer, adoption of soil conservation measures, etc.

Then the word “rehabilitation” is used in a more limited sense to cover only measures such as application of fertilizer, supply of vacancies, and so on, but excluding the actual uprooting of old tea and replanting of the entire area with new clones.

Then again the word “rehabilitation” is used for the operation of improving the soil of an old tea area after the old tea has been uprooted and before the new tea is planted. One of the speakers at the Symposium this afternoon used the word “rejuvenation” of the soil for this operation. Still another speaker used the word “reconditioning” of the soil in referring to this operation. I think it will be very useful if we could agree on some standard terms for these various purposes. I suggest that we use the word “rehabilitation” as a very general word to cover any method by which we improve the yield of a tea land whether by uprooting the whole area and replanting it with high-yielding clones or by measures of a more limited nature such as the application of fertilizer, supplying of vacancies, adoption of soil conservation measures, etc.

The word “replanting” could then be reserved for the operation of actual uprooting the old tea and replanting with new material, and the word “reconditioning” could be used for the operation of improving the soil on an area from which old tea has been uprooted by planting with suitable grasses or by some other method.

Mr. Irvine.— What type of survey plan would be necessary in respect of an area replanted under the Tea Replanting Subsidy Scheme ?

Mr. Mahadeva.— In the case of the Rubber Replanting Subsidy Scheme, if there is a fairly recent survey plan of the estate and the area to be replanted is a distinct block which can be demarcated on a tracing from that plan by a licensed surveyor, then the Department does not insist on a fresh survey of the area replanted. In other cases a special survey of the area replanted is necessary. I think a similar procedure could be adopted in the case of the Tea Replanting Scheme,

Mr. J. W. Craig.—What is the position regarding a tea-cum-rubber estate if the estate replants a tea area with rubber and a corresponding rubber area with tea. Would it be entitled to subsidies under both the Rubber and Tea Rehabilitation Schemes?

Mr. Mahadeva.—I personally see no objection. If a person who owns both rubber and tea uproots an area of old rubber and plants it with tea and at the same time uproots a corresponding area of old tea and replants it with rubber, he should be entitled to subsidies both under the Tea Subsidy Scheme and the Rubber Replanting Subsidy Scheme.

Mr. V. G. W. Ratnayake.—Under the Scheme, as at present drafted, estates under 100 acres are debarred from participating in the Replanting Scheme and will not be entitled to replant with V.P. material and claim replanting subsidies. Is Mr. Mahadeva willing to allow such estates to participate in the Replanting Scheme if they have the necessary technical know-how and the financial resources, etc.?

Mr. Mahadeva.—Under the Tea Subsidy Act and the Regulations framed thereunder, there is no *legal* stipulation that only estates over 100 acres in extent are entitled to participate in the Replanting Scheme and receive replanting subsidies. This dividing line between estates over 100 acres and small-holdings and small estates under 100 acres is not a division made under a legal requirement but is one made on the basis of a purely administrative decision.

In the course of my remarks earlier I gave the reasons why I felt that replanting with V.P. material would not be practicable on the majority of small-holdings and small estates under 100 acres in extent. It is true that there may be a few estates under 100 acres in extent which have the financial resources and the technical know-how to participate in the Replanting Scheme. The extent which such an estate will receive for replanting each year will however be quite small.

Take an estate of 50 acres for instance. Even if we allow such an estate 3 or 4 per cent. of its total acreage for replanting each year it would mean that the estate could replant $1\frac{1}{2}$ or 2 acres each year and receive replanting subsidies at the rate of Rs. 2,500 on the areas replanted. If the same estate participates in the Rehabilitation Scheme instead of in the Replanting Scheme, it could rehabilitate 15 or 20 acres each year and receive subsidy at the rate of Rs. 6.50 per acre. In the majority of cases it would be more advantageous for the estate to participate in the Rehabilitation Scheme instead of in the Replanting Scheme. In any case, I am sure, you will agree that no estate should be allowed to participate *both* in the Replanting Scheme and the Rehabilitation Scheme. The estate must opt for either one Scheme or the other.

Major G. Pyper.—Unlike in the case of up-country estates there are many mid-country estates which do not have their own nurseries and would therefore not have planting material to participate in the Replanting Scheme. Could these estates use tea seed instead of V.P. material? Or, would the Department establish a Central Nursery to supply V.P. material?

Mr. Mahadeva.—When the question of establishing a large central nursery was discussed earlier with the T.R.I., the Institute was against the proposal because of the possibility of root infection when planting material was transported from the central nursery to individual estates. In the case of small-holdings participating in the Rehabilitation Scheme, the Tea Control Department will make arrangements to obtain the necessary tea seed and supply it to the small-holders, deducting the cost of the seed from the subsidy. In the case of estates over 100 acres in extent, on the other hand, which participate in the Replanting Scheme, the Department felt that each estate should make its own arrangements for obtaining V.P. material. Under the Scheme, as at present drafted, the use of tea seed instead of V.P. material would not be allowed in the case of estates over 100 acres in extent.

Major Pyper.— Many of the estates I referred to cannot have their own nurseries as the soil was eroded and there is no spare land on the estate. Are you going to plant nurseries for V.P. on this useless land ?

Mr. Mahadeva.— If the land is as useless as you make out, should it be planted with V.P. material at all ? If the land is very badly eroded it would be better not to attempt to join the Replanting Scheme at all.

Dr. Visser.— Cannot 10 or 12 estates join together and have a Central Co-operative Nursery ?

Mr. Ratnayake.— I revert to the question which was asked earlier, *i.e.* planting tea on an area under rubber and vice versa.

Mr. Mahadeva.— A person or Company who owns both tea and rubber could uproot an area of old rubber and plant it with tea and receive subsidies under the Tea Subsidy Act provided he eradicates an equivalent area of old tea.

Question.— What is the position of a person who owns only rubber ? Will he be allowed subsidies for replanting rubber with tea just as subsidies are now paid for rubber owners who replant their lands with *cocoa* ?

Mr. Mahadeva.— The essential difference is this: The Rubber Rehabilitation Scheme is not now financed from a cess. Even when the cess was levied, the same people who were paying the cess, namely, the rubber owners, got the money back either for replanting their old rubber lands in rubber or for planting them in *cocoa*. Similarly, under the Tea Scheme, a person who owns tea can instead of replanting an old tea area with tea, replant an area of rubber belonging to him somewhere else with tea and claim subsidies from the Tea Subsidy Fund, provided he eradicates an equivalent acreage of his old tea. Such a person is entitled to receive subsidies from the Tea Subsidy Fund because he is making contributions towards the cess on tea exports. But a person who owns rubber alone makes no contributions whatever to the Tea Subsidy Fund and is not therefore entitled to receive subsidies from the Tea Fund for replanting a part of his rubber acreage in tea.

Question.— Would such a person be entitled to receive money from the Rubber Subsidy Fund for replanting his rubber land with tea?

Mr. Mahadeva.— Under the present Regulations the answer would be "No". Even if the Regulations of the Rubber Replanting Scheme were amended to enable a subsidy to be paid, the subsidy would be at the rate of Rs. 700 which is the rate of subsidy for rubber and not at the rate of Rs. 2,500 per acre which is the rate of subsidy paid under the Tea Replanting Scheme.

Mr. S. S. Perera.— When you concede that an owner can uproot rubber and plant tea, will that concession be given only in the event of an authorised Technical Officer reporting that the land is unsuitable for rubber but suitable for tea ?

Mr. Mahadeva.— I think we should certainly verify whether the land is suitable for tea. I do not think we need make certain whether the land is unsuitable for rubber. We need not worry about this aspect of the matter because it makes no difference to us if a person owing (say) 500 acres of tea somewhere who is entitled to plant 10 acres a year under the Tea Subsidy Scheme plants this extent [on jungle land or on rubber land owned by him elsewhere provided he eventually eradicates an equivalent area of old tea. There is no need to ensure that the land is unsuitable for rubber,

Question.— How would you view a reduction in the Island's rubber acreage in your capacity as Rubber Controller ?

Mr. Mahadeva.— Personally I think it would not be a bad thing. The future for rubber being what it is, I think we should try to reduce the total acreage under rubber in Ceylon and increase the yield per acre from this area of rubber. This is the policy of the Ministry of Agriculture — the improvement in the yields of the land under rubber and not an extension of the acreage under rubber.

Question.— Did I understand Mr. Mahadeva correctly when he said that you could exchange areas not only within a Company but even within an Agency ?

Mr. Mahadeva.— Exchange of acreages to which estates are entitled to under the Replanting Scheme could certainly be allowed in the case of estates owned by the same Company, or the same individual or individuals. I do not think however that it will be appropriate to allow similar exchanges between estates managed by the same Agency.

Mr. G. K. Newton.— In answering me this morning Mr. Mahadeva stated that the proceeds of the cess of 4 cts. a lb. on tea exports would be earmarked for the purposes of the Tea Rehabilitation Scheme and that this money would not be utilised for any other purpose. We have this assurance that this money is going to be put into safe deposit. I think it was also made clear today that the replanting of tea would cost more than Rs. 2,500 per acre. Bearing in mind that there would be a number of Companies and proprietors who would not be able to afford the extra expenditure involved, over and above Rs. 2,500 per acre, it seems likely that there would be a build-up in this Fund. I hope that in the event of a build-up those who are prepared to plant may be given assistance to a greater extent than at present envisaged. Otherwise I feel the Scheme would fail as I said this morning.

Mr. Mahadeva.— I can certainly repeat the assurance which I gave this morning that all the money in the Tea Subsidy Fund will be used for the purpose of the new Rehabilitation Scheme. There is not likely to be any build-up in the Fund because, although there are some estates which, either on account of their not having the necessary financial resources or the necessary experience of planting with V.P. material or for some other reason, are not prepared to come into the Scheme in the early stages, yet there will be others who are prepared to plant larger acreages under the Scheme immediately. Then the available funds could be made use of to give subsidies for larger acreages to those estates who have the necessary planting material and financial resources to carry out their replanting programmes immediately. Under the Rubber Replanting Scheme, we have in each of the last 6 years received applications for much larger areas than could be replanted with the funds available. Under the new Tea Scheme I hope we will receive sufficient applications to use up all the money that is available.

Mr. Newton.— There is another point which I would like to mention Sir. It is the case of tea which is abandoned and not pulled out when you replant in other areas. A suggestion has been made that this tea be allowed to grow. I can see a danger in this proposal because my experience is that immediately there is a boom in tea prices, the tea which has been abandoned for many years is suddenly brought into production and I can easily visualise that squatters will squat on your abandoned tea, cut it across and start plucking it. I would suggest poisoning the tea. Dr. Visser told us that poison for weeds is poison for tea. So probably there will be no difficulty in adopting my proposal.

Mr. Mahadeva.— I fully agree that the best thing would be to accept the suggestion made this morning that instead of abandoning or uprooting old tea, it might be eradicated by poisoning.

Mr. Coultas.— What proportion of the cess of 4 cts. a lb. do you propose to allow to small-holdings? Will the accounting be kept quite separately? You talked this morning of building factories on a Co-operative basis for small-holders. From where will the money for this purpose come?

Mr. Mahadeva.— In the course of the remarks I made earlier this afternoon I stated that, of the total expenditure of approximately Rs. 100 million, roughly 80 per cent. would be spent on the replanting part of the Scheme (*i.e.* the part dealing with estates over 100 acres in extent) and 20 per cent. would be spent on the rehabilitation part of the Scheme intended for tea small-holdings and small tea estates under 100 acres in extent. This proportion would be disturbed only if the volume of applications from large estates for replanting falls short of the target acreage and these estates do not take up all the money that is earmarked for them. If this happens it will be very difficult to resist the pressure from small-holders to divert these unused funds to the small-holdings part of the Scheme.

As regards Mr. Coultas' second question, I should state that although there is provision in the Tea Subsidy Act to build factories for small-holders with monies from the Tea Subsidy Fund, it was very clearly stated in the "Statement of Objects and Reasons" presented to Parliament on the Tea Subsidy Act that the proceeds of the cess of 4 cts. a lb. would not be used for this purpose. It was very clearly laid down that the proceeds of the cess would be used for the payment of subsidies for the replanting of estates and the rehabilitation of small-holdings, and that if any money was required for the erection of factories for small-holdings or to help in the marketing of small-holders' green leaf, then that money would have to be provided out of a separate grant from Parliament.

Mr. N. M. Sanders.— If the acreage applied for is such that some estates are allowed bigger allocations, should not some sort of ceiling acreage be laid down?

Mr. Mahadeva.— If funds are available why should not those estates which are prepared to carry out large replanting programmes be allowed to do so? I do not think that any ceiling should be set.

Question.— Would it be possible for the Tea Research Institute to have Advisory Officers in each district to advise estates on replanting undertaken under the Scheme?

Dr. Joachim.— The Tea Research Institute has already approved the creation of a post of Chief Advisory Officer. It is likely that this appointment will be made early next year and that thereafter provision will also be made for the appointment of District Field Officers. Now that this Conference has strongly indicated the need of such advisory services I am sure the Board will consider the proposal for an extension of the Scheme originally visualised.

Mr. D. S. Jayawickreme.— May I ask Mr. Mahadeva whether an estate with a fairly high yield can come into the Scheme?

Mr. Mahadeva.— The Scheme envisages the replanting of tea and does not stipulate that the areas replanted should be areas of uneconomic tea. We heard this morning of cases in India where tea with yields of 1,000 lbs. or more were being uprooted and replanted. If anybody in Ceylon who has an estate which gives over 1,000 lb. an acre wishes to uproot and replant it with V.P. material there should be absolutely no objection. There should be no stipulation that the land is too good for replanting.

Mr. Jayawickreme.— Suppose an estate of over 100 acres with a yield of 1,500 lb. an acre applies for assistance under the Rehabilitation Scheme in the form of subsidised manure, etc. instead of participating in the Replanting Scheme, would it be entitled to such assistance ?

Mr. Mahadeva.— No, for the simple reason that a large estate with a yield of 1,500 lb. per acre should be making sufficient profit to be able to pay for its manure and subsidised manure would not be necessary. The larger estates require assistance only for replanting and not for cultivation operations such as application of manure and so on.

Question.— May I ask Dr. Joachim a question ? There is a rumour that some of our V.P. material has been sent to China. Is this correct ?

Dr. Joachim.— It is true, Sir, that a small quantity of material was sent out for experimental purposes and it was done at the request of the Government.

Question.— Did we get anything in return ?

Dr. Joachim.— I do not think they have any vegetatively propagated tea in China as yet.

Mr. Mahadeva.— Although we did not get any tea planting material from China, I believe that other types of planting material (for example, certain strains of paddy) were sent out from China to Ceylon. This exchange of planting material was not only in respect of tea but in respect of a large number of other crops as well.

Mr. D. W. G. Burroughs.— I would like to make a suggestion. I would like to suggest that tea areas which are abandoned, when equivalent acreages are planted with V.P. material elsewhere, should be re-afforested.

Mr. Mahadeva.— I think this is an excellent suggestion.

Question. If a person has 110 acres of tea at one place and 20 acres in 5 or 6 small-holdings in another place, under which Scheme would he be entitled for assistance ?

Mr. Mahadeva.— He would be entitled to replanting assistance in respect of the 110-acre estate and to rehabilitation assistance in respect of each of the small-holdings.

Question. At the end of the 5-year period when the 30,000 acres have been replanted with V.P. material, is there a guarantee that we will still own these estates ?

Chairman.— I think that is the most sensible question asked today. All this talk of rehabilitation and replanting depends on one question: Are you going to pay out all these large amounts of money and at the end of 5 years see your castle come down to the ground ? This I think is a question that I should have asked the Minister this morning.

From Audience.— I think if Government gives a guarantee that no nationalisation will take place in the next 20 years most owners will forget the expense, even if it costs Rs. 10,000 per acre they will replant.

Chairman.— But can the present Government give such a guarantee as their term is only for another 2½ years and then probably you might have somebody else in power.

Mr. Mahadeva.— I am not a politician Sir; I am an administrator. I do not determine policies; I only execute them. I would like to say, however, in reply to the question which the Chairman just raised, namely, why should anyone put his money into replanting when he does not have a guarantee that his tea estate will remain his in a few years' time. The answer to this question is surely that if he invested this money in any other form, nationalisation is as likely to affect him as if he had invested his money in the tea industry. He might as well therefore invest his money in the replanting of tea which as I said before brings a quick and rich return.

Chairman.— Gentlemen, we had a very full discussion today and I would like to thank Mr. Mahadeva for the manner in which he answered all the questions on the Rehabilitation Scheme.

OBSERVATIONS BY THE DIRECTOR, TEA RESEARCH INSTITUTE

I think the hour is late and it would be inflicting on you a penalty for your good attendance and patience today, if I were to keep you for longer than a few minutes. I do not think it is really possible to summarise our discussions. They were on diverse subjects and I believe were clear enough for all here to understand and appreciate. So that my task in this respect has been simplified and I would, with your permission, merely content myself with thanking on behalf of the Tea Research Institute those speakers, representing the various tea districts, for the very useful information which they have conveyed in their short papers on various aspects of tea rehabilitation and replanting. We have heard from some of the districts that the problems of tea rehabilitation are very much more serious than we probably imagine, and I am sure that the Advisory Board of the Tea Rehabilitation Scheme which the Tea Controller shortly proposes to establish will bear this in view.

I have in mind particularly the problems of the Kandy district; they are rather serious and it would be unfair by the planters in this area if they were to be penalised because nature has been hard on them, and man himself in the years gone by has been hard on nature. Well, that is a point I am sure gentlemen that you will give me a mandate to carry, as Acting Director of this Institute, to the Tea Rehabilitation Board, and to plead that until such time as we do play our part — and we have a part to play in this matter — that those districts which are what I call sub-normal in this respect, may get special consideration.

I have also gentlemen to thank our visitors from overseas who have given us interesting accounts of their experiences and their conditions in regard to the subject which we have been discussing. The point that was made out by the last speaker, *viz.* of contact between the research institutes — or the members of the research institutes — is one which I whole-heartedly support because I think that, apart from the good feeling and the fellowship which these contacts engender, they make for more efficient working on the part of the officers of both institutes concerned, and I would as the Acting Director of the Institute, make a plea to my Chairman and the members of the Board who are here present today that this type of visit should be encouraged to the fullest. I do not think I need say more on this matter.

We have, I think, today justified the holding of this symposium on replanting. We have had views expressed on all aspects of the subject, and particularly on the administrative aspect which the Tea Controller has so admirably steered for all of us for our benefit. Mr. Chairman, with these few words, I thank all those who have come here — I know that this is part of your duty to do so — but I would like, in a particular manner, and in a personal manner, if I may say so, to thank everyone here who has patiently listened for the past 8 hours almost, to discussions, talks and discourses on the various aspects of tea rehabilitation and replanting. I may be here as Acting Director for perhaps only a few weeks longer, but I can assure you that this scheme will have the fullest support of the Tea Research Institute in respect of all its technical activities. That is all I have to say and with this I thank you all once again.

VOTE OF THANKS BY MR. H. CREIGHTON, CHAIRMAN, PLANTERS' ASSOCIATION OF CEYLON

Gentlemen, well we have certainly had a day of it and as the Director has said we have been here for something like 8 hours and now I think that every moment of that 8 hours have been of great interest. This I may say is the first symposium as such which I have ever attended.

When I received the invitation to attend the symposium being that ignorant I looked up the dictionary and discovered with great glee that a symposium was a 'gleeful drinking party'. I accepted it with great alacrity, but I am afraid I was extremely disappointed in the first few minutes. However further reference showed that a symposium was a collection of or discussion of ideas on theories which this has been and I have found it most entertaining and most interesting.

We have had the scientific views of our own T.R.I. officers; we have had those from visitors overseas; we have had independent and practical views from the districts—not necessarily the collection of individual speakers—but a collection of views from a number of people within the district. We have had one interesting little incident which may give rise to gossip that one certain agency is going to be taken over by another, and all we know, it has definitely been a good day.

We owe a considerable debt of gratitude to the T.R.I. staff and to the others and I think particularly a debt and a vote of thanks to the Director. In spite of his very placid and mild expression it is quite obvious that he does not believe in the existence of an unsurmountable object or a riddle without an answer. He certainly has demonstrated in the time that he had been Low-Country Officer and Director that there is great drive in him and we particularly at the low-country owe him a great debt of gratitude for the fact that all but our low-country station is now an established fact after a very long fight and a very long struggle.

I speak on behalf of the Planters' Association therefore and would say how much we have appreciated this symposium—the work that has gone into it—its organisation and its interest. Thank you very much, Sir.

The next few words I have to say concerns Mr. Mahadeva who I think we must congratulate for standing up under such a concentrated attack for so long. Considering he did not have notice of the questions, I think he did splendidly. He is shortly to gain some support in the formation of a Committee who will go into all these numerous and various problems and I would make the suggestion that all these various questions be put on paper, passed through the district P.As to our Secretary—I don't look at him as I say this—and he can then present them in a consolidated form and get a proper answer after Mr. Mahadeva and his Committee have had time to go into it.

There are a lot of snags—a lot of unanswered points—and I think it is a little bit unfair to us to get him to quote a rule until his Committee has gone into the matter. I think that would be the best way to put all our questions, problems and doubts before him; so if you will send them in through your district Chairmen to the Headquarters—we will get an answer for you. Thank you, Gentlemen.

VOTE OF THANKS BY MR. C. SELWYN SAMARAWEERA, CHAIRMAN, LOW-COUNTRY PRODUCTS ASSOCIATION

I wish to associate myself and the L.C.P.A. with the remarks and sentiments expressed by Mr. Creighton in his usual able and chatty manner. I am sure we are very grateful to Dr. Joachim and his scientific staff and the other members of his staff for having conceived the idea and having brought us all here to-day to listen to such an interesting series of talks running over the last few hours. Time is running out, but I should also like to add my mead of praise to Mr. Mahadeva who as Mr. Creighton said stood fire and cross fire from all sections of this house as a true and proper officer of his Government, as he always has been, and is. Thank you.

CLOSING REMARKS BY MR. F. AMARASURIYA, CHAIRMAN, BOARD OF CONTROL, TEA RESEARCH INSTITUTE

Gentlemen, we now come to the end of our Symposium and before we depart I have certain duties to perform.

In the first instance, I must thank all of you who responded to our invitation and are here to co-operate with us in seeing that this Symposium is productive of the greatest possible result, so far as the Tea Replanting Scheme is concerned.

To all those who have made a contribution to it by reading papers or taking part in the discussions, I would express our sincere thanks.

I have now to convey our great appreciation of the assistance which has been rendered us by:

1. the Planters' Association of Ceylon in organising the representation of planting interests for the Symposium and obtaining the speakers for the different agricultural areas, and in a number of other ways. With this expression of thanks I would like to associate the Agency Section of the Planters' Association;
2. the Ceylon Chamber of Commerce for having so kindly made available to us this room and helped us in every way possible;
3. the Police, in so readily co-operating with us by ensuring the smooth working of the traffic arrangements and providing a special car park for the occasion;
4. the Ceylon Tea Propaganda Board, for having kindly provided the necessary refreshment of "tea," whose interests we represent;

5. the L.C.P.A. Chairman and its representatives;
6. the Steering Committee responsible for the successful organisation of the Symposium; and finally
7. the Director of the Tea Research Institute, Mr. Douglas Austin, the Secretary of this Symposium, and the other members of the Institute for all their efforts and work in connexion with the Symposium and in making it the great success it has been.

Gentlemen, I now declare the proceedings of the Symposium closed.

CLONES CULTIVATED, ACREAGE UNDER CLONES, YIELDS AND CUTTINGS LIKELY TO BE AVAILABLE

Prepared by T. Visser and F. H. Kehl

District	No.	Estate	Elevation	Rainfall	Clones	Area planted Acres	Approximate No. of cuttings likely to be available by end of:		
							1958	1959	1960
AMBAGAMUWA	1	Kenilworth	2,000'	220.00"	Kenilworth 13/3, 16/3, 22/1, 31/7, 31/11; Craighead 13; T.R.I. 2024, 2025	2.00	66,000	170,000	240,000
BADULLA	2	Demodera	3,300'	79.44"	Balangoda 4, 12, 13, 15, 16, 18; T.R.I. 2024, 2025		—	—	—
	3	Oodoowerre	2,600–4,350'	93.95"	T.R.I. 18, 25, 740, 777, 2016, 2021, 2022, 2024, 2025, 2026, 2046		5,000	10,000	40,000
	4	Sarnia	3,300'	85.00"	Queenstown 1/5, 3/4, 4/4; T.R.I. 2023, 2024	2.00	5,000	50,000	500,000
		Uva Propagation Scheme	4,000–4,500'	80.00"	Neluwa 3/1, 4/2; Uva Highlands 9/3		120,000	120,000	120,000
BALANGODA	5	Balangoda Group	3,500'	110.00"	Balangoda M.T.11, M.T.12, M.T.13, M.T.16, M.T.17, M.T.18, M.T.20, M.T.26, M.T.31, M.T.35; D.G.3, D.G.7, D.G.32, D.G.39, D.G.43, D.G.52, D.G.54, D.G.66	10.00	46,000	68,000	1,000,000
	6	Pettiagalla	3,000'		Pettiagalla 1A/1, 2A/1, 2A/3, 11/4, 14/4, 13B/1, N.P.1/3, N.P.3/3, P.T.G.14/5, Palmgarden 2, 3, 4, T.R.I. 25, 2023, 2024, 2026		16,000	41,000	64,000
DICKOYA	7	Kirkoswald	4,500'	115.18"	Kirkoswald 136, 145, 150		30,000	36,000	45,000
	8	Kotiyagalla	4,500'	90.00"	Kotiyagalla K.62, K.65, V.37; T.R.I. 2024, 2025	2.00	36,000	48,000	50,000
	9	Ottery	5,000'		Ottery 1B/3, 5/7, 5/8, 5/18, 5/30, 6A/35, T.R.I. 2024	8.50	—	—	—
	10	Strathdon	4,200'	156.00"	Strathdon P.M.1, P.M.2, P.M.3, P.M.7, P.M.8, P.M.9, P.M.10; T.R.I. 777, 2024, 2025, 2026	0.50	—	—	—
	11	Wanarajah	4,356'	115.00"	Kirkoswald 136, 145; T.R.I. 2023, 2024, 2026		5,000	10,000	20,000
DICKOYA LOWER	12	Carolina Group	3,300'	200.00"	Carolina 7/10, 6/3; Agrawatte 7/10, 2/18, 7/3; T.R.I. 2024, 2025; Kenilworth 16/3	10.00	150,000	200,000	250,000
	13	Mount Jean	3,700'	229.09"	Mount Jean 1, 3, and 7/16		20,000	22,000	24,000
	14	St. Heliers	4,000'	203.79"	St. Heliers 11; Craighead 13; T.R.I. 2024		10,000	10,000	10,000
	15	Vellai Oya	4,386'		Vallai Oya 4/1, 45/12, 45/16; Kirkoswald 136, 145; T.R.I. 740, 1526, 2024, 2025		59,000	76,000	97,000

District	No.	Estate	Elevation	Rainfall	Clones	Area planted Acres	Approximate No. of cuttings likely to be available by end of:		
							1958	1959	1960
DIMBULA	16	Albion	4,500–5,500'	105.51"	Albion 2/1, Ardlaw 5, 11, 23, 25, T.R.I. 777, 2024		—	—	—
	17	Bambrakelly	4,500'	110.00"	T.R.I. 2024 and 2025		20,000	30,000	80,000
	18	Chrystler's Farm	4,000'		Chrystler's Farm 1, 26, 60, 61, 63, 66; T.R.I. 216, 1114, 2023, 2024, 2025 and other clones	1.75	—	—	—
	19	Diyagama West	5,000'	75.00"	Diyagama A–H, J–N and P; and Nos. 1–17 and 19–27	12.00	4,728,800	Approx. the same as 1958	
	20	Ferham	4,500'	120.00"	Ferham M.V.120, M.V.125 and T.R.I. 216, 740, 777, 1526, 2024	4.00	Unlimited		
	21	Harrington	4,400'	160.00"	T.R.I. 25, 2024 and 2025		7,000	12,000	15,000
	22	Mayfield			Mayfield		20,000	20,000	20,000
	23	Talankande	4,500'		Talankande 42, 45, 48, 53, 56, 69, 70, 76; T.R.I. 2024, 2025		Unlimited		
	24	Tangakelle	4,500'	96.95"	Tangakelle T.K.2, C.Y.9, Wallaha W.Y. Somerset E.7.7, E.7.27, Kenilworth 16/3, T.R.I. 2024	33.00	Unlimited for use of estates in Company		
	25	Talawakelle	4,000'	107.24"	Talawakelle K.K.41, 43, 46, 63, 66, 72, 73, T.K.27; T.R.I. 2024, 2025		40,000	60,000	60,000
	26	Tillicoultry	4,800'	115.72"	Tillicoultry T.C.9, T.C.10, T.C.16		—	—	—
	27	Waltrim	4,500'	90.00"	Waltrim 26, 36, 37; Kirkoswald 136, 145; T.R.I. 777, 1076, 2024, 2025	32.00	30,000	30,000	30,000
	28	Wootton	4,100'	137.72"	Wootton 23, 43, 45, 86; Craighead 13; Dambattenne 434; Drayton 95; Kirkoswald 136, 145, 150; T.R.I. 740, 2016, 2024, 2025, 2118, 2132, 2145	0.25	40,000	80,000	80,000
	29	Ythanside	4,400–5,000'	130.00"	Craighead 13, Nayabedde 3, T.R.I. 2023, 2024, 2026		18,000	20,000	25,000
DOLOSbage	30	Barnagalla	2,900–4,700'	140.03"	Craighead 13, T.R.I. 777, 2016, 2024, 2025, 2026		65,000	100,000	300,000
	31	Craighead	2,600–3,400'	135.55"	Craighead 13, T.R.I. 2020		135,000	140,000	145,000
	32	Galamuduna	3,800'	229.02"	Drayton 1, 95; T.R.I. 777, 2024		100,000	200,000	300,000
	33	Somerset	2,400'	127.69"	Somerset SS/1; Craighead 13	28.00	200,000	200,000	200,000

District	No.	Estate	Elevation	Rainfall	Clones	Area planted Acres	Approximate No. of cuttings likely to be available by end of:		
							1958	1959	1960
GALLE	34	Talangaha	300'	140.00"	T.R.I. 25, 2023, 2024, 2026		20,000	50,000	100,000
	35	Walpitia	150'	120.00"	T.R.I. 2023, 2026		9,000	12,000	14,000
HANTANE	36	Hantane	2,500'	88.00"	Nayabedde 3; T.R.I. 2024		45,000	60,000	75,000
HAPUTALE	37	Thotulagalla	5,000'	101.77"	Thotulagalla 2/2, 5/2, 5/3, 5/35	2.00	10,000	10,000	10,000
HEWAHETA UPPER	38	Rutland	2,600–4,400'	98.01"	Rutland 6, 11, 26, 57	16.00	—	—	—
KALUTARA	39	Gikiyanakande	350'	152.00"	Palmgarden 518; Poronuwa 37; Sirikandura 106, 123; T.R.I. 2023, 2026	2.00	60,000	100,000	200,000
	40	Millakande	100–600'	157.17"	Sirikandura 106, 123; T.R.I. 2023, 2024, 2025, 2026		30,000	45,000	70,000
	41	Sirikandura	450'	160.00"	Sirikandura 106, 126 and T.R.I. clones	9.0	1,000,000	2,000,000	2,000,000
KEGALLE	42	Karandupona	800'		Karandupona 1, 4; T.R.I. 2016, 2021, 2022, 2023, 2024, 2025 and 2026	—	—	—	—
KELANI VALLEY	43	Ederapolla	900'	155.00"	Ederapolla 31, 40, 41, 42, 43, 45, 46, 54, 95, 134; T.R.I. 2021, 2022, 2023, 2024, 2025, 2026	116.25	2,000,000	3,000,000	3,000,000
	44	Kelani	400'	168.00"	T.R.I. 25, 2023, 2026	1.00	50,000	100,000	150,000
	45	Kiriporuwa	300–800'	160.00"	T.R.I. 25, 2023, 2024, 2026	3.00	120,000	120,000	120,000
	46	Noori	1,200'	160.00"	Craighead 13, Kenilworth 13/3, 16/3; Sirikandura 106, 123; T.R.I. 777, 2016, 2021, 2022, 2023, 2024, 2025, 2026		—	—	—
	47	Pindenioya	500–879'	125.96"	Pindenioya P.O.5; Ederapolla 40, 42, 46; T.R.I. 2022, 2024		—	—	—
	48	Wagolla	300–1,000'	160.00"	T.R.I. 2023, 2026		60,000	100,000	100,000
	49	Madulkelle	2,300–4,900'	115.02"	Craighead 13		16,000	24,000	—
KELEBOKKA									
KOTMALE	50	Donside	2,000–3,000'	174.73"	Craighead 13; Kenilworth 13/3, 16/3; T.R.I. 2024, 2025		58,000	60,000	70,000
	51	Goorookoya	1,800–3,300'	137.75"	Craighead 13; T.R.I. 2023, 2024, 2025, 2026	2.00	—	—	—
	52	Oonoogaloya	2,700–4,200'	150.00"	Oonoogaloya 1, 5, 8, 16, 23, 24, 25		35,000	60,000	75,000
	53	Ravenscraig	2,200–3,500'	139.30"	Kenilworth 16/3, T.R.I. 2024, 2025		30,000	30,000	30,000
	54	Tyspane	3,200–5,000'	—	Tyspane 1, 2, 3; Craighead 13; Kenilworth 16/3; Sheen 5/3; T.R.I. 2024		—	—	—

District	No.	Estate	Elevation	Rainfall	Clones	Area planted Acres	Approximate No. of cuttings likely to be available by end of		
							1958	1959	1960
MADULSIMA, LUNU- GALA AND HEWA ELIYA	55	Adawatte	2,700'	110.00"	Nayabedde 3; T.R.I. 1294, 1526, 2023, 2024, 2025	3.50	10,000	40,000	80,000
MASKELIYA	56	Glentilt	4,500'	140.39"	Glentilt 3/1, 3/2, 3/5, 3/33, 6/3, 7/1, 9/1, 9/2, 9/3		8,000	11,000	11,000
	57	Moray	3,720–5,420'	140.39"	Moray MB, ME, MH, MV, MX, VA, VE, VD		12,000	14,000	16,000
	58	Stockholm	4,500'	136.00"	T.R.I. 23, 777, 1526, 2023, 2024, 2025, 2026	4.00	25,000	30,000	40,000
MATALE NORTH	59	Selegama	2,000'	95.00"	Palmgarden 518; T.R.I. 18, 25, 777, 2022, 2023, 2024, 2025, 2026	4.00	5,000	15,000	25,000
MATURATA	60	Kabaragalla	3,500–5,200'	140.00"	T.R.I. 2021, 2024, 2025, 2026	10.00	100,000	200,000	200,000
	61	Mahacoodagalla	5,000–6,000'	110.00"	Diyagama N		—	70,000	
	62	Maturata Group	5,150'	108.71"	Maturata Clones; T.R.I. 2024		20,000	20,000	20,000
	63	Rillamulle	5,100'	120.96"	Rilamulle Clones; T.R.I. 2024		10,600	10,600	10,600
MEDAMAHANUWARA	64	Dodangalla	4,000'	100.00"	T.R.I. 2024		10,000	15,000	20,000
MORAWAK KORALE	65	Berubeula	—	—	Craighead 13; Ederapolla 40, 42, 46; Kenilworth 15/2, 16/3; Kew 4A/4, Opata 35, 308, 314; Sirikandura 106, 123; T.R.I. 216, 777, 1114, 1294, 1526, 2016, 2021, 2022, 2023, 2024, 2025, 2026	6.00	Unlimited		
	66	Dankoluwa	300'	112.28"	Dankoluwa 19, 34, 36, 50, 58; Ederapolla 40; Hunuwella 154; Opata 308; Palmgarden 518; T.R.I. 2023, 2024, 2026		—	—	—
	67	Enselwatte	3,000'		Ederapolla 40, 41, 42, 45, 46; Ouvahkellie 4; Sirikandura 106; Talankande 48; T.R.I. 216, 777, 1114, 1294, 1526, 2016, 2021, 2022, 2023, 2024, 2025, 2026	9.00	Unlimited		
NILAMBE	68	Le Vallon	2,000–5,000'	130.22"	Le Vallon C.G.1/2, C.G.1/3, H.M.8/11; T.R.I. 2024		27,000	45,000	55,000
PASSARA	69	Cannavarella	4,500'	92.80"	Cannavarella C.V.4/B1, C.V.5/B1, M.G.3/B, N.K.4/B29; T.R.I. 2021, 2024		120,000	170,000	250,000
	70	El Teb	1,800–4,000'	140.17"	El Teb 7, 9, 30; Nayabedde 3; Passara 1, 22; Queenstown 1/5, 4/4, Wattegoda 154, 537, 557; T.R.I. 18, 777, 1114, 1294, 1526, 2023, 2024, 2025, 2027	14.75	255,000	337,000	467,000
	71	Gonakelle	3,000'	85.46"	Gonakelle T.S.35, M.L.23; T.R.I. 1294, 1526, 2022, 2023, 2024, 2026	14.75	160,000	160,000	160,000

District	No.	Estate	Elevation	Rainfall	Clones	Area planted Acres	Approximate No. of cuttings likely to be available by end of:		
							1958	1959	1960
PUNDULOYA	72	Harrow	3,500–5,600'	112.20"	————		12,000	15,000	15,000
	73	North Pundaluoya	3,200–5,300'	115.00"	Balapokuna 40, 170; Craighead 13; Diyagama N; Kirkoswald, Sanquhar 88, Srikandura 106; T.R.I. 2021, 2022, 2024, 2025	—	100,000	125,000	150,000
PUSSELLAWA	74	Attabage	3,000'	135.00"	Attabage 23, 24; Craighead 13; Ederapolla clones; T.R.I. 740, 1526, 2022, 2024, 2025		—	20,000	40,000
	75	Delta	3,500'	120.00"	Delta 40, D/S/10, D/S/11, D/S/37, D/S/51; T.R.I. 2024, 2025		62,000	78,000	85,000
	76	Sanquhar	2,800'	110.00"	Sanquhar B.P.M.4, N.P.1, S.Q.B.P; Craighead 13; T.R.I. 2021, 2024, 2025		10,000	20,000	30,000
RAMBODA	77	Weddemulle	4,000–6,100'	153.04"	Weddemulle, CN/D, RB/5, W.M/2, Delta 40; T.R.I. 25, 777, 1526, 2016, 2022, 2024, 2025		6,000	14,000	25,000
RAKWANA	78	Hatherleigh	1,800'	105.40"	Opata 35, 308; Sirikandura 103, 106; Wellandura 2, 34; T.R.I. 18, 25, 740, 1526, 2016, 2022, 2023, 2024, 2025, 2026		—	—	250,000
	79	Palamcotta	1,150'	96.00"	Palamcotta “Cotta”; Balangoda M.T.12, M.T.13, M.T.15, M.T.16; T.R.I. 740, 777, 1076, 2023, 2024, 2025, 2026		25,000	50,000	100,000
RATNAPURA	80	Endane	—	—	Endane clones	0.44	—	—	—
	81	Lellopitiya	1,000'	156.54"	Lellopitiya Clones, Sirikandura 123; T.R.I. 18, 2022, 2023, 2024, 2026		45,000	45,000	50,000
	82	Palmgarden	100'	170.00"	T.R.I. 25, 2023, 2024, 2026	50.00	400,000	400,000	400,000
	83	Pelmadulla	—	—	Nilgama 2, 4, 7, 12, 15, 28, 30, 53, 63, 72, 89, 203, 208, 211, 212, 228, 235, 246, 256, 262, 263, 274, 275, 285, 345, 355, 395, 425, 435, 475, 525, 575, 766, 806, 925, 945, 955	10.00	—	—	—
UDA PUSSELLAWA	84	Gordon	4,300–5,861'	102.12"	Gordon 7/6; T.R.I. 2024, 2025		—	—	—
	85	Hugoland	3,500'	55.00"	Hugoland 3/16, 3/32, 4/51; T.R.I. 2024, 2025, 2026 and others	6.00	100,000	100,000	200,000
	86	Ragalla	4,980'	119.35"	Rg.A.55, Rg.A.119, Rg.A.228, Rg.A.238, Rg.B.158, Rg.B.275, Rg.H.O.49, Rg.H.O.81, Rg.H.O.94, Rg.H.O.136, Rg.H.O.142, U.D.30, U.D.98, U.D.153, U.D.169; T.R.I. 740, 777, 1526, 2022, 2024, 2025		—	—	—

N.B.—In purchasing cuttings it is advisable to obtain them in the form of shoots. A shoot should give, on the average, about five single internode cuttings.

NOTES ON PERFORMANCE OF CLONES

Prepared by F. H. Kehl and T. Visser

AMBAGAMUWA DISTRICT

Kenilworth (No. 1)

Kenilworth 13/3, 16/3, 22/1, 31/7, 31/11; Craig-head 13; T.R.I. 2024, 2025 are all very good growers.

Kenilworth 13/3 has given a yield of 2,400 lbs. per acre per annum.

BADULLA DISTRICT

Demodera Group (No. 2)

T.R.I. 2025 is slow until established and then it is fast; is resistant to drought. Balangoda clones 16 and 18 are good; 15 is fair; 4, 12 and 13 very slow. T.R.I. 2024 is slow.

Sarnia (No. 4)

T.R.I. 2023 and 2024 are growing well.

Uva Propagation Scheme, Neluwa.

Neluwa 3/1, 4/2 and Uva Highlands 9/3 are vigorous growers and have given 1,900 to 2,000 lbs. per acre.

BALANGODA DISTRICT

Balangoda Group (No. 5)

<i>Clone</i>	<i>Yield</i>
Balangoda M.T. 11	2140 — 5th year
„ M.T. 12	3363 — 5th year
„ M.T. 16	2695 — 4th year
„ M.T. 17	2554 — 3rd year
„ M.T. 18	4406 — 3rd year
„ M.T. 20	3201 — 3rd year
„ D.G. 3	4812 — 4th year
„ D.G. 7	3494 — 4th year
„ D.G. 39	2305 — 2nd year
„ M.T. 13	4207 — 3rd year

Growth of T.R.I. 25 is vigorous and T.R.I. 2023 and 2024 rapid. Uneconomic tea replanted.

Pettiagalla (No. 6)

Pettiagalla 1A/1, 2A/1, 2A/3, 11/4, 13B/1, Palm-garden 2, T.R.I. 25 are good growers. T.R.I. 2023, 2024 and 2026 are excellent.

DICKOYA DISTRICT

Kirkoswald (No. 7)

Kirkoswald 136, 145 and 150 are all very good growers.

Kotiyagalla (No. 8)

Kotiyagalla K. 62 K. 65, V. 37 and T.R.I. 2024 and 2025 are very good growers.

Ottery (No. 9) The yields of the best Ottery clones and T.R.I. 2024 are as follows:—

1. B/3	(914 Bushes)	1,474 lbs. per acre in 1957
5/8	(709 ")	1,777 " " " " "
6. A/35	(894 ")	1,793 " " " " "
2024	(556 ")	1,417 " " " " "

Uneconomic tea replanted.

Strathdon Group (No. 10) Strathdon P.M. 1 has given a yield of 2,140 lbs. per acre.

DICKOYA LOWER DISTRICT

Carolina Group (No. 12) Carolina 7/10. A promising clone. Has given a yield of 2,100 lbs. per acre.

Mount Jean (No. 13) Mount Jean clones 1, 3 and 7/10. All good growers. Poria patches replanted.

DIMBULA DISTRICT

Albion (No. 16) Albion 2/1 is a good grower.

Chrystler's Farm (No. 18) The yield of mixed clones is 3,408 lbs. per acre for 11 months.

Diyagama West (No. 19)	<i>Clone</i>	<i>Yield</i>
	Diyagama A	3081 Vigorous grower
	" C	2576
	" D	2413
	" E	2284 Vigorous grower
	" K	2445
	" P	2214
	" 6	2061
	" 9	2020
	" 10	2085
	" 19	2088 Vigorous grower
	" 21	2225

Ferham (No. 20) Clone 2024 is a very vigorous grower.

Talankande (No. 23) Talankande 48 has given a yield of 2,847 lbs. and 42 a yield of 1,914 lbs. per acre.

Talawakelle (No. 25) Growth of all clones is vigorous. Uneconomic tea replanted.

Tangakelle (No. 24) Tangakelle C.Y. 9 was brought into plucking at $2\frac{1}{2}$ years from planting on old tea land and has given a yield of 1,345 lbs. for the 1st year.

Plants removed carefully from nursery and planted direct into the field.

APPENDIX II—*Contd.*

Tillicoultry (No. 26)	Tillicoultry T.C. 9 reported to give over 3,500 lbs. per acre. Poria patches replanted.
Waltrim (No. 27)	T.R.I. 2024 and 2025 are excellent growers. Uneconomic tea replanted.
Wootton (No. 28)	Wootton 23, 45, 86 and T.R.I. 2024 and 2025 are very good growers. Uneconomic tea replanted.
DOLOSbage DISTRICT	
Craighead (No. 31)	Craighead 13 is a good grower and is resistant to blister blight. Uneconomic patches replanted.
Somerset (No. 33)	Somerset SS/1 reported to give 1,500 lbs. per acre.
GALLE DISTRICT	
Talangaha (No. 34)	T.R.I. 25, 2023, 2024, and 2026 are excellent growers.
HAPUTALE DISTRICT	
Thotulagala (No. 37)	Thotulagala 2/2, 5/2, 5/3, 5/35. Good growers.
HEWAHETA UPPER DISTRICT	
Rutland (No. 38)	Rutland 6, 11, 26, 57. The yield of No. 57 reported to be 3,456 lbs. per acre. Uneconomic tea replanted.
KALUTARA DISTRICT	
Gikiyanakande (No. 39)	Old rubber areas not thoroughly grubbed were prone to Fomes infection.
Sirikandura (No. 41)	Clones reported to yield over 3,000 lbs. per acre.
KEGALLE DISTRICT	
Karandupona (No. 42)	Karandupona 1 and 4 are drought resistant.
KELANI VALLEY DISTRICT	
Ederapolla (No. 43)	Yield of a block of 2½ acres of mixed clones is 2645 lb. per acre. V. P. plants require more care and maintenance and protection than seedlings in the early stages, as they are more susceptible to drought than seedlings. V.P. plants are transported directly to the field for planting in trenches. Care is taken in filling trenches to see that there is no root disturbance in transplanting and that roots are allowed to spread naturally. Hersall or Cylindrical transplantation is neither necessary nor economically feasible in large scale planting.
Kiriporuwa (No. 45)	Growth of 25, 2023, 2024 and 2026 is good.

Pindenioya (No. 47) The yield of Pindenioya P.O. 5 is reported to be 2,166 lbs. per acre.

KOTMALE DISTRICT

Goorookoya (No. 51) T.R.I. 2023, 2024, 2025 are doing well.

Oonoogaloya (No. 52) The average yield of Oonoogaloya 1, 5, 8, 16, 23, 24 and 25 is 2,200 lbs. per acre.

Tyspane (No. 54) Tyspane 2 is reported to have given a yield of 2,440 lbs. and Craighead 13, 2,880 lbs. per acre. 6 to 7 years from planting.

MADULSIMA, LUNUGALA AND HEWA ELIYA DISTRICTS

Adawatte (No. 55) Nayabedde 3, T.R.I. 1294, 1526, 2023, 2024 are extremely good growers.

MASKELIYA DISTRICT

Glentilt (No. 56) Glentilt 7/1, 9/1, 9/2, 9/3 are good growers. Poria patches replanted.

Moray (No. 57) Moray M.H., M.V., M.X., V.A. are very good growers.

Stockholm (No. 58) T.R.I. 2023, 2024, 2025, 2026 are very promising.

MATURATA DISTRICT

Kabaragalla (No. 60) T.R.I. 2021, 2024, 2025 and 2026 are very good growers. Uneconomic tea replanted.

MORAWAK KORALE DISTRICT

Berubeula (No. 65) T.R.I. 2023 and 2026 are very vigorous growers. At 4 to 6 months they are ready to be put into the field. Clone 2026 is reported to have given a yield of over 2,500 lbs. per acre.

Dankoluwa (No. 66) Dankoluwa 19, 34, 50, 58, Hunuwella 154 and T.R.I. 2023, 2024 and 2026 are very good growers.

Enselwatte (No. 67) The growth of T.R.I. 2016, 2021, 2022, 2023, 2024, 2025 and 2026 is very good.

NILAMBE DISTRICT

Le Vallon Group (No. 68) T.R.I. 2024 is a very good grower.

PASSARA DISTRICT

Cannavarella (No. 69) Cannavarella C.V.5/B.1 has given a yield of 4,900 lbs. per acre. C.V.4/B.1, N.K.4/B.29, M.G.3/B.1 yields of over 3,100 lbs. per acre.

Gonakelle (No. 71)

Average yield of the better clones for 3 years is as follows:—

Gonakelle T.S. 35 — 1,505 lbs. per acre per annum
 „ M.L. 23 — 1,481 lbs. per acre per annum

PUNDULOYA

North Punduloya (No. 73)

Craighead 13, T.R.I. 2024, 2025 are very good growers.

PUSSELLAWA DISTRICT

Delta (No. 75)

Growth of Delta D.40, D/S/10, D/S/11, D/S/37, D/S/51 and T.R.I. 2025 is satisfactory.

RAKWANA DISTRICT

Hatherleigh (No. 78)

Growth of 2024 is very good.

RATNAPURA DISTRICT

Endane (No. 80)

The yield of a block of .44 acres of 10 mixed clones opened in jungle land is 4,179 lbs. per acre in the 6th year after planting.

Palmgarden (No. 82)

The yields for the 3rd year are:—

Clone 2025 — 2,665 lbs. per acre
 „ 2023 — 2,660 „ „ „
 „ 2026 — 2,925 „ „ „

UDA PUSSELLAWA DISTRICT

Gordon (No. 84)

Gordon 7/6, T.R.I. 2024 and 2025 are exceptionally good growers.

Hugoland (No. 85)

Growth of Hugoland 3/16 3/32, 4/51, T.R.I. 2024, 2025 and 2026 is excellent.

Ragalla (No. 86)

T.R.I. 2024 and 2025 very good growers.

A SUMMARY OF THE INSTITUTE'S RECOMMENDATIONS ON SOIL REHABILITATION PRIOR TO REPLANTING

J. A. H. Tolhurst

The following table is taken from a general article in the *Tea Quarterly*, September 1956, and, together with the quotation, represents very concisely our aims regarding soil rehabilitation. Experience since that date has merely served to emphasise the value of manuring the Guatemala grass generously, *i.e.* at 4 cwt. per acre per cut.

PERIOD	OPERATION	INTENTION
Soil rehabilitation	<ol style="list-style-type: none"> 1. Following uprooting and contour lining plant thickly with grass, preferably 2 rows between the future tea rows 2. Manure regularly with little or no forking 3. Cut regularly and spread loppings all over surface 4. Continue for preferably 2 years 	<ol style="list-style-type: none"> 1. Maximum soil cover; minimum soil disturbance 2. Maximum production of organic matter above and below ground; building up mineral nutrient reserves 3. Protection of soil from sun, rain, wind and packing by labourers' feet 4. Disease control; build up of stable soil crumb structure
Soil activation	<ol style="list-style-type: none"> 1. Cut grass right out 2. Leave grass stumps whole on the surface 3. Broadcast manure 4. Hole, incorporating old thatch in the holes 	<ol style="list-style-type: none"> 1. 2. Wind break for young tea (see conclusions) 3. To assist the increased microbial activity from 1 and 4 4. To provide steady supply of nutrients to the young tea

APPENDIX III

IX	X	XI	XII
Planting distance and Method	Manuring per plant	System of bringing into bearing	Shade trees planted and time
4 × 2'	Sterameal—frequent small applications	Thumb-nailing	
2' holes	1st year Sterameal. Afterwards T.500	Bending	Grevillea, Dadaps, Albizzia, Gliricidia
3' holes × 12" × 9"	T.524— $\frac{1}{4}$ oz. every 3 months	Light trimming	Grevillea, Dadaps, Albizzia, Gliricidia
4' area forked and holes	5 tons compost before planting. 1 oz. T.175 every 6 months	12 months cut at 4" 21 months cut at 8" 30 months cut at 12"	Gliricidia, Grevillea and Bush crops at time of planting tea
1 $\frac{1}{2}$ ' holes 12"	Sterameal and T.175 2-3 times/year Application N50-N174	Thumb-nailing followed by pruning	Grevillea, Albizzia as soon as land cleared
4' × 2 $\frac{1}{2}$ '	T.175 1 oz./2 months followed by Sterameal 4 times/year 320 lb./acre/year	Bending and Layering	Gliricidia Dadaps, Albizzia and Grevillea same time as tea
2' Semi tour	Sterameal "A" frequent small applications	Thumbnail Pruning and Bending	Pruinosa, Dadaps and Grevillea
2'-4' inch 18"	T.500 at 450 lb./acre/year every 2-3 months	Layering	Tephrosia, Dadap and Grevillea

APPENDIX III—Contd.

IX	X	XI	XII
Planting distance and Method	Manuring per plant	System of bringing into bearing	Shade trees planted and time
4-5' × 2-3' rows forked	Sterameal 1 oz. every 3 months	Bending	Albizzia and Grevillea
4' × 2' holes and deep forking	Sterameal in nursery. 1st year. Baur's mix. 1 oz. 4 times 2nd year C.T.P. mix. 2 oz. 3 times	Bending and cut across before plucking	Acacia, Grevillea and Dadaps after clearing land
5' × 2' Trenches 1 1/4' × 3/4'	Pig compost 10 lb./plant in trench. At planting 1 oz. Sterameal. 1st year T.175 1/4 oz. every 4 months. 2nd year T.175 1/2 oz. every 4 months 3rd year 1 oz. T.175 every 4 months	Thumb-nailing followed after 1 year by bending	Dadaps, Albizzia and Acacia
4' × 2' Double holes 3' × 1 1/2' × 15"	Organic manure 1/2 oz. every 3 months	Bending	Acacia
2' × 3' holes 18" × 7" × 7"	Sterameal 1 oz./bush	Bending	—
Trenches	T.180 1st yr. 1 oz. T.180 2nd yr. 1 1/2 oz. T.180 3rd yr. 2 oz.	Layering	Gliricidia, and Albizzia

APPENDIX III—Contd.

IX	X	XI	XII
Planting distance and Method	Manuring per plant	System of bringing into bearing	Shade trees planted and time
× 2' holes	Sterameal $\frac{1}{2}$ oz. at start once a month, increased to 1 oz. 7 lb. cattle manure once a year	Bending	Albizzia, Grevillea and Dadaps at time of planting Tea
× 3'-4' holes × 11 $\frac{1}{2}$ '	T.180, T.R.I. recommendation	Thumbnailing, Pruning and Bending	Grevillea and Acacia
× 3' holes × 12"	Animal meal 1 oz. at planting; 1 oz. after 6 mths.; 1 $\frac{1}{2}$ oz. after 1 yr.; 2 oz. at 18 mths.; 2 $\frac{1}{2}$ oz. at 2 yrs.	Centering at 4" in nursery. 1 yr. cut at 4-8" 2 yrs. cut at 8-12" 3 yrs. cut across 12-15"	Grevillea when tea is 1 yr. old
× 2' holes × 20"	In holes 3-4 lbs. cattle manure, $\frac{1}{2}$ oz. artificial every month after 6 months	Bending 1-3 times after 6 mths., then periodically pruned	After 2 yrs. due to competition for water
× 11 $\frac{1}{2}$ ' × 18"	Pig manure 10 tons/acre T.180 3 applications/year	Thumbnailing, Bending and staking side branches	Acacia wind belts at time of planting Tea
× 2' double × 15" × 15"	Cattle manure in holes 4 mths. after Planting T.180 1st yr. 1 $\frac{1}{2}$ oz. 2nd yr. 3 oz.	Pegging down	Same time as Tea

APPENDIX III—*Contd.*

IX	X	XI	XII
Planting distance and Method	Manuring per plant	System of bringing into bearing	Shade trees planted and time
4' × 1½' holes 9" × 15-18"	T.175 every 6 months	Bend over at 10 mths. 20 mths. cut across 10-12"; 30 mths. cut across 32"; 36 mths. prune at 18-20"	Gliricidia and Albizzia
4' × 2½'	1st yr. 2 oz. animal meal 2nd yr. 2 oz. T.180	—	Same time as Tea
1½' × 3½' holes 18" × 12"	Sterameal 1 oz. at planting; 1 oz. at 6 mths.; 3 oz. following year	Bending and top plucking at 20 mths., then lightly pruned to 12"	Same time as Tea
Same as for Vegetatively-Propagated			
4' × 1½'	Same as for Vegetatively-Propagated		
—	Same as for Vegetatively-Propagated		
4' × 2' sides	T.180 1st yr. ½ oz. × 2 2nd yr. 1 oz. × 2 Afterwards T.500	Bending and pegging Light trimming Thumb nailing	Grevillea, Gliricidia, Dadap, Bush crops in alternate rows
—	Same as for Vegetatively-Propagated		

"Our . . . proposal is really very simple, and it can be described as an attempt to get back to jungle conditions, but for convenience and greater efficiency we have aimed at a grass jungle. The original tea plantings made use of fertility which had accumulated over the centuries, and which had often vanished alarmingly once cultivation had imposed new and exacting conditions on the soil. We cannot hope to regain more than a small part of the virgin fertility in a rehabilitation period which, from economic necessity, can only last for one or two years, but as the object of replanting is to grow better tea, and as the future of the planting will depend so much on the initial success of the clearing, the Institute cannot stress too strongly the need to implement all the proposals, set out above, in the most generous fashion."

APPENDIX

Revised Guatemala Grass Manure Mixture

This manure, now known as the "T.R.I. Grass Manure," has been altered slightly by substituting rock phosphate for superphosphate.

New Grass Manure:—

Sulphate of ammonia	...	5	parts by weight
Saprophosphate	...	2½	" " "
60% Muriate of Potash	...	1½	" " "

Composition:—

		<u>% N</u>	<u>% P₂O₅</u>	<u>% K₂O</u>
Old mixture	...	10	9	12
New mixture	...	11	8	10

Used at the same rates as before, the new Grass Manure will supply 10 per cent. more nitrogen at a saving in manure cost of approximately 7 per cent.

METHODS OF REHABILITATION AND PLANTING

Prepared by A. W. R. Joachim and L. M. de W. Tillekeratne

VEGETATIVELY - PROPAGATED MATERIAL

APPENDIX III

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
District	No.	Estate	Acreage and age of planting	Land previously	Method of clearing	Method of Rehabilitation	Method of and age at planting	Planting distance and Method	Manuring per plant	System of bringing into bearing	Shade trees planted and time
AMBAGAMUWA	1	Kenilworth	1½—	Patna	Manual	Nil	Basket plants 8-10 months	4½'-4 × 2' holes	Sterameal—frequent small applications	Thumb-nailing	
BALANGODA	2	*Balangoda	12½— 1—4 years	Tea (74 years)	Mechanical	Planted with Guatemala for 2 years	Basket plants 1 year	4' × 2' holes	1st year Sterameal. Afterwards T.500	Bending	Grevillea, Dadaps, Albizzia, Gliricidia
DOLOSBAE	3	Craighead	½—3 years	Mana and Scrub	Manual	Nil	Basket plants 2 years	4' × 3' holes 1½" × 12" × 9"	T.524—¼ oz. every 3 months	Light trimming	Grevillea, Dadaps, Albizzia, Gliricidia
	4	Somerset	33— 1—6 years	Old Rubber	Mechanical	Heavily thatched with Guatemala and sunflower. Planted with bush manures	Earth balls in paper bags 1 year	2' × 4' area deep forked and 9" holes	5 tons compost before planting. 1 oz. T.175 every 6 months	12 months cut at 4" 21 months cut at 8" 30 months cut at 12"	Gliricidia, Grevillea and Bush crops at time of planting tea
DICKOYA	5	*Ottery	.8½— 3—8 years	Tea (70 years)	Manual and Mechanical	Some blocks with T. vogelli 2 years. Others nil	Hershall 9 months	5' × 1½' holes dia. 12"	Sterameal and T.175 2-3 times/year Application N50-N174	Thumb-nailing followed by pruning	Grevillea, Albizzia as soon as land cleared
LOWER DICKOYA	6	Carolina	.50— 1—5 years	Patna	Manual	Guatemala with trenches for 2 years and no rehabilitation	Hand forked 9-18 months	3½'-4' × 2½'	T.175 1 oz./2 months followed by Sterameal 4 times year 320 lb. acre/year	Bending and Layering	Gliricidia Dadaps, Albizzia and Grevillea same time as tea
DIMBULLA	7	Diyagama West	21— 1—10 years	Fuel clearing and tea area	Manual	Guatemala grass 3 years	Transplanter 10/15 months	4' × 2' Semi Contour	Sterameal "A" frequent small applications	Thumbnail Pruning and Bending	Pruinosa, Dadaps and Grevillea
	8	*Talankande	15— 1—6 years	Tea (60 years)	Manual	Mana and Guatemala with trenches for 2 years. Manuring of trenches with 50 lb. N3 months before planting	Transplanter and stumps 1-2 years	5' × 2'-4' Trench 8" × 18"	T.500 at 450 lb./acre/year every 2-3 months	Layering	Tephrosia, Dadap and Grevillea

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